



Broadband Business Case Analysis (BCA)

For

**Arizona Strategic Enterprise
Technology Office (ASET)**

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September 2, 2013 (Version V01Z2)

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Table of Contents

	<u>Page</u>
Preface	3
Executive Summary	4
Conclusions and Recommendations	6
The Need for Expanded Rural Broadband Capacity	7
Positive Trends and Portents for Broadband Evolution	13
Community Planning Guidelines and Recommendations	14
WACOG Broadband Business Case Analysis (BCA) Process	22
WACOG County Overviews and Broadband Gap Analysis	24
WACOG Regional Broadband Project Profiles	41
WACOG Broadband Community Planning Next Round	46
Appendices	
Appendix A: WACOG Broadband Steering Committee	48
Appendix B: Arizona Broadband Statistics	51
Appendix C: WACOG Broadband-Related Web Presence	54
Appendix D: Arizona Broadband Map	55
Appendix E: DAP Broadband Grants & Resources	58
Appendix F: Glossary of Telecom Terms	60

WACOG Broadband Business Case Analysis (BCA)

Preface:

High speed Internet is the new essential infrastructure for this century's job creation, educational and healthcare transformation, and economic development, just as highways, railroads, canals, electricity, and telephone were for previous generations. It is the 21st century's infrastructure challenge and it is becoming ever more critical that **Western Arizona Council of Governments (WACOG - <http://www.wacog.com/>)** communities have adequate bandwidth to help our local economies, create jobs, and improve education, healthcare, public safety, and quality of life.

Earlier this year saw the formation of a **WACOG Broadband Steering Committee (<http://www.wacog.com/broadband.html>)** with broad participation among regional economic development, educational technology, transportation, government IT, healthcare, and public safety stakeholders. The Committee and its activities are being funded, in part, by a federal broadband grant administered through the **State of Arizona's Digital Arizona Program (DAP - <http://azbroadband.gov/>)**.

WACOG has been selected to receive these funds to help advance broadband assessment, gap analysis, strategy, tactics, and application adoption in our region, Yuma, La Paz, and Mohave counties. **International Research Center (<http://www.researchedge.com/>)** has been hired under the grant and their consultants are facilitating the WACOG Broadband Steering Committee, collecting and analyzing regional broadband and economic data, producing a series of reports, and otherwise assisting with this project.

There are several **Digital Arizona Program (DAP)** initiatives at the state level. The **Digital Arizona Council (DAC)** with their web presence at http://www.digitalarizona.gov/Digital_Arizona_Council/About_DAC.html meets quarterly and is working on an Arizona Broadband Strategic Plan draft. The **Arizona Broadband Map** portal (http://www.digitalarizona.gov/Maps/Arizona_Broadband_Maps.html) offer interactive insight to broadband coverage across the state and the community planning version integrates substantial demographic and economic data to aid policy analysis and planning. DAP has recently launched an **Arizona Broadband Speed Test** available for resident and enterprise use at <http://www.digitalarizona.gov/Survey/AffiliationQuestion.html> for gathering information about broadband coverage and performance across the State. They are strongly encouraging WACOG broadband stakeholders to take the speed test periodically and to also distribute the information and request to utilize among their respective stakeholder community.

The **Arizona Strategic Enterprise Technology Office (ASET)** coordinates these initiatives. Their office address is 100 N. 15th Ave. Suite 400, Phoenix, AZ 85007, and their main phone number is: (602) 542-2250. Additional information and resources may be found online at the ASET website: <http://aset.azdoa.gov/> and the Digital Arizona Program's (DAP) website at <http://DigitalArizona.gov/>. The DAP primary email address is question@DigitalArizona.gov.

Disclaimer: This report is written by International Research Center, a research and consulting firm. None of the information in this report should be construed as official public policy of WACOG or the Arizona State government. However, funding to assist in producing this report came from a federal NTIA grant managed by an Arizona State agency.

WACOG Broadband

Business Case Analysis (BCA)

Executive Summary:

The **Western Arizona Council of Governments** (WACOG - <http://www.wacog.com/>) is a nonprofit membership corporation representing local governments and providing a wide variety of services within the three rural Arizona counties of Yuma, La Paz, and Mohave. The **WACOG Broadband Steering Committee** (<http://www.wacog.com/wacog-broadband-steering.html>) was formed with broad participation among regional economic development, educational technology, transportation, government IT, healthcare, and public safety stakeholders to help ensure that the WACOG region has adequate bandwidth to help our local economies, create jobs, and improve education, healthcare, public safety, and quality of life.

This **Business Case Analysis (BCA)** focuses on digital capacity needs and availability for the WACOG region and selected communities within the region. The BCA and associated community broadband planning and technical assistance is funded by a federal grant awarded to the State of Arizona. Launched in 2009, NTIA's State Broadband Initiative (SBI) implements the joint purposes of the (Bush era) Recovery Act of 2009 and the Broadband Data Improvement Act of 2008, which envisioned a comprehensive program, led by state entities or non-profit organizations working at state direction, to facilitate the integration of broadband and information technology into state and local economies. Economic development, energy efficiency, and advances in education and health care rely not only on broadband infrastructure, but also on the knowledge and tools to leverage and use that infrastructure.

Input for this BCA for the three counties included the development of specific Community Data Sets, integrating these data sets with the Arizona Broadband Map, and identifying broadband providers and their respective services. Broadband speeds were obtained and analyzed for each county and their respective population centers from the FCC speed test, speedmatters.org, and Akamai (from their content delivery network's performance). The Service Providers and their respective service types were generated from the Arizona Digital Broadband Map. Current infrastructure including providers and services, and underlying rights-of-way resources such as utilities, roads, and rail routes are identified in the Community Data Sets and the complementary **WACOG Broadband Technical Report**.

The results of analysis from these data sources confirm that rural Arizona requires better high-speed broadband capacity. Given the expansive, often difficult rural terrain across the state of Arizona, community-serving organizations like libraries, public schools, and healthcare facilities often have difficulty accessing high-speed broadband services essential for education, commerce, and economic development.

Some 46% percent of Arizona households have connectivity at less than the National broadband definition of 4 Mbps download and 1 Mbps upload. Akamai data shows that Arizona ranks 45th in the nation with a 4.8 Mbps average speed experienced by broadband subscribers (second quarter 2012). There is significantly less availability of high-speed services in rural parts of the state compared to metropolitan areas. Unless something is done, this "digital divide" will only increase because modern Internet is becoming increasingly video intensive. The next generation of Internet and applications will be all about high definition video, requiring as much as ten times the broadband capacity of previous generation Internet uses. In addition, businesses will increasingly rely on cloud computing,

WACOG Broadband Business Case Analysis (V01Z2)

web-conferencing with real time video for communications and collaboration, and telework, each layering on the need for even greater broadband capacity. So previous definitions of sufficient Internet access speeds are rapidly becoming obsolete.

The Governor signed legislation during the 2011-12 session (SB 1402) that enables Arizona's state highway rights of way to be utilized to help build out badly needed middle mile broadband fiber capacity to rural areas of Arizona while supporting other high-capacity middle mile and long haul connectivity needs. A number of companies have expressed interest in utilizing the resources made available by SB1402. During the most recent legislative session, a telemedicine bill (SB 1353) was passed for payment parity for remotely delivered services, the implementation of which will simultaneously reduce medical costs, save lives, and improve rural economies by requiring health insurance providers to reimburse medical specialists for services provided via broadband-based telemedicine. And a data center bill (HB 2009) was passed to encourage regional placement of data center facilities via favorable tax policy.

Specifically, this Business Case Analysis (BCA) shows WACOG regions have limited broadband capacity, diversity, and backhaul capabilities. Minimum Sufficient Speed Threshold tables were identified for four major application areas, economic development, education, telemedicine and public safety. Even with speed thresholds as low as 10 Mbps download and 5Mbps upload, no community reviewed in these three WACOG regions could be considered as meeting threshold standards for all of these important applications. This is a critical issue that must be resolved for continuous economic development and improvements in education, healthcare and public safety to continue as well as for the general economic well-being of WACOG communities. The importance of doing this is because it will ultimately:

Foster local economic development by:

- Attracting new businesses plus retaining and expanding the current businesses
- Providing local jobs and developing new skill-sets necessary to increase employment and community sustainability in today's knowledge economy
- Supporting local entrepreneurs who engage with the global economy using broadband and the Internet to deliver goods and services around the globe

Improve educational success within local communities by:

- Increasing the effective use of interactive digital learning solutions such as self-paced learning and remote content resources for transformational education initiatives
- Providing distance learning and collaboration in classrooms, homes, and businesses for students of all ages with universities around the world
- Enabling real-time progress accountability for student and staff performance supporting early intervention and remediation

Improve health care availability and quality while lowering costs by:

- Using high-speed broadband connectivity for local doctors and healthcare providers to collaborate with remote specialists
- Improving local triage to reduce unnecessary transportation of patients to remote facilities
- Providing remote well-being check-ups from existing local facilities such as schools, libraries, etc.
- Providing enhanced in-home care with monitored sensors and video check-ups by remote health care providers

Improve public safety and save lives by:

- Delivering accurate real-time data to all first-responders as needed and across jurisdictional/agency boundaries and connecting ad-hoc groups on a per event basis

Conclusions and Recommendations:

Within each of three WACOG counties and their respective communities, WACOG should now put in place strategies and action plans, as described in the **Community Planning Guidelines and Recommendations** of this BCA to meet the emerging broadband capacity requirements to support the four key Internet application areas.

The central theme for these action plans is communication among all stakeholders. The importance of maintaining a dialogue between community stakeholder groups, including elected officials, and broadband providers to learn issues and strategize paths forward cannot be over emphasized.

These strategies and action plans will require WACOG to designate group leaders for each of the application focus areas or community-driven broadband remediation, as well as performing community-by-community gap analysis for each application. It will also require further identification of existing local infrastructure assets, service providers and services, and the formulation of ROI improvement strategies and plans for incentivizing provider investments in building or expansion of broadband resources with appropriate implementation plans.

Demand aggregation is an important means for incentivizing providers to provide improved broadband services to rural communities. This includes defining and aggregating the demands among public institutions, commercial enterprises, non-profits and residential users. Pledges of support to purchase better broadband services as they become available should be secured from the stakeholders whenever possible.

Use the resources available. This includes this BCA, the WACOG Broadband Technical Report, and the WACOG Broadband Grants & Resources Guide as well as continued services from International Research Center. The Arizona Community Planning Broadband Map is an invaluable resource that needs to be promoted and utilized by all planning participants. The Arizona speed test should also be popularized and utilized.

Local leadership is essential in accurately defining broadband requirements and cultivating initiatives. WACOG should take the lead to identify champions to lead the action plans and to see that all stakeholders remain engaged. Cities and counties need to be involved because they control access to resources such as ROW that can alter the investment equation and are closer to local stakeholder interests. Representatives of the four application areas, economic development, education, healthcare and public safety, need to be further engaged to become and remain active participants in implementing the action plans defined in the Community Planning Guidelines and Recommendations. The community action plans for satisfying the identified requirements will lead to model projects for the communities. The broadband providers active in the region need to contribute to this process at each step and become a true partner in the communities' broadband solutions.

The driving force for each of these communities should be to incentivize investment by the private sector in the expansion and building of high-speed broadband technology and infrastructure by finding ways to enhance investor ROI calculations through:

- The aggregation of local demand,
- The identification of new uses and users,
- The reduction of right-of-way costs and use fees
- The reduction of time and costs relating to permitting and zoning processes

Taking these actions and creating mutually beneficial partnerships with private investors will lead to the building of better Internet resources community by community.

The Need for Expanded Rural Broadband Capacity:



One of many factors that support broadband enhancement projects include obtaining a clear view of the current digital capacity of an area, and what is required to support the steadily increasing demand of future applications. Creating such a baseline and community expectations is important because of the impact that increased broadband has on economic development.

Multiple studies have shown the connection between economic development and higher bandwidth. A 2011 Chalmers University study concluded that every doubling of broadband speed increased GDP by 0.3%. (Rohman, 2012) If this Chalmers University calculation is applied to rural Arizona's economy it potentially has the following impact:

- Arizona Annual GDP - \$277 billion
- X 15% (rural portion of Arizona GDP)
- X 0.6% (4 x increases in rural digital capacity - (1 Mbps to 4 Mbps or 4 Mbps to 16 Mbps) equals \$249 million potential Arizona Rural GDP Increase year over year just from digital capacity expansion.

High capacity broadband service providers and their respective services bring opportunities to these rural areas. The economic development trend for rural Arizona is dependent on small service businesses, designed to complement larger (often global) organizations. Without broadband, these small businesses will not be sustainable.

At the current time, downstream speeds of 10 Mbps and upstream speeds of 5 Mbps will adequately support the applications such as medical file sharing (basic), remote diagnosis (basic), remote education, enterprise productivity applications, consumer Internet use, sensor networks, and building control and management. These broadband uses impact the four application areas of focus for this report: Economic Development, Education, Telemedicine, and Public Safety use.

Below is a table of recommended speeds relative to specific applications. The recommended speeds analysis for digital applications comes from the California Broadband Task Force. It quantifies the requirements for various applications used for business, jobs, education, telemedicine and public safety. This analysis is applicable to Arizona. Adding credence to this, a letter released from Arizona's Superintendent of Public Instruction, John Huppenthal, recommends a speed standard of no less than 6 Mbps, Down and Up, for individual students, both at school and in their homes, because this enables the use of new Arizona based distance learning content, electronic curriculum delivery and real-time course-by-course testing and accountability tools. This closely correlates with the general indication expressed in the table below recommending 10 Mbps download and 5 Mbps upload to accomplish the more meaningful applications for Commerce, Health, and Education if communities are to benefit from or have access to the emerging Digital economy.

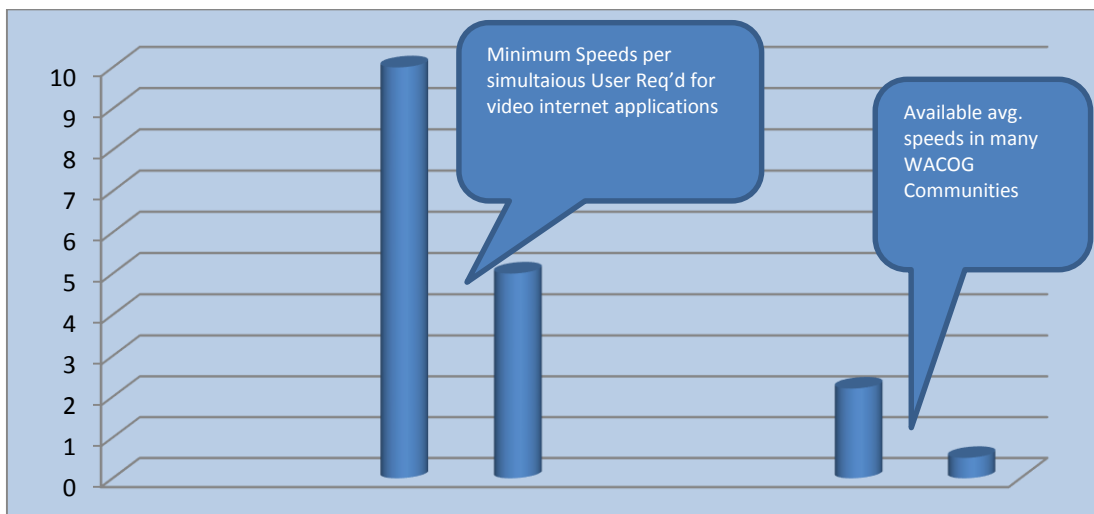
Downstream and Upstream Speed Range

Applications

1 Mbps - .5 Mbps	Voice over Internet Protocol telephony, Basic email, Web browsing - (simple sites), Streaming music, Small display, Low quality video (highly compressed)
5 Mbps - 1 Mbps	Web browsing (complex sites), Email (larger file size attachments), Remote video surveillance, IPTV (Standard Definition), File sharing (small/medium), compressed broadcast video (1 screen), Streaming music.
10 Mbps - 5 Mbps	File sharing (large), IPTV-Standard Definition (3 TVs), Broadcast Standard Definition video, Video streaming (2-3 TVs), High Definition video downloading.
10 Mbps - 5 Mbps	Medical file sharing (basic), Remote diagnosis (basic), Digital Learning & Remote education (Common Core standards), Building control and management.
100 Mbps - 10 Mbps	Telemedicine, Educational Services (small schools), Broadcast video HD and some High-Definition, High quality tele-presence (distance learning), High Definition surveillance, Smart-Intelligent building control.
1 Gbps - 100 Mbps	High Definition telemedicine, Multiple Student Educational Services (large schools), Uncompressed High - Definition video, HD-IPTV (Many TV's), High Definition - Video on Demand. Gaming (immersion). 3D modeling.

An FCC National Broadband Plan milestone, by 2015 is, “100 million U.S. homes should have affordable access to actual download speeds of 50 Mbps and actual upload speeds of 20 Mbps.” The National Broadband Plan further states: “The United States must lead the world in the number of homes and people with access to affordable, world-class broadband connections. As such, 100 million U.S. homes should have affordable access to actual download speeds of at least 100 Mbps and actual upload speeds of at least 50 Mbps by 2020, according to the national plan. For Community Anchor Institutions, the National Broadband Plan states: “Every American community should have affordable access to at least 1 gigabit per second broadband service to anchor institutions such as schools, hospitals, and government buildings.” We have a long way to go.

Modern Application Speed Recommendations to WACOG's Average County Speeds Comparison



The recommended sufficient speeds necessary to support economic development, education, telemedicine, and public safety applications are simply not available to meet the needs of various WACOG communities and stakeholders. Declared broadband coverage and tested speeds show substantial deficiencies against recommended application speed standards. Thus, going forward, the WACOG region needs to seek to enable the availability of sufficient digital capacity for each of the four critical applications, as well as general community well-being.

Additionally, the region also requires an effective *redundant* middle-mile infrastructure to protect and secure against area wide Internet outages, either natural or manmade. Recent experience shows the impact of the stranded nature of Arizona's Internet middle-mile network infrastructure, and the lack of fail-safe redundancy or adequate backup for emergencies. This has resulted in a number of WACOG communities experiencing downed 9-1-1 systems, and prolonged Internet outages resulting in millions of dollars in economic damage. Ideal digital infrastructure is constructed in rings or interconnects between network segments so if there is a cut in a line, the system can route traffic in other directions. All three WACOG counties and their associated population centers do not have sufficient redundancy to support their networks in the event of a line disruption or generally for what would be considered resilient broadband connectivity.

Education and Job Readiness:

The demands of the new information-based economy require substantial changes to the existing K-12 and higher education systems. The 21st century workplace requires both a better-educated and a differently educated work force to address the widening gap between the skills of graduates and modern workforce demands.

A good or arguably great **STEM (Science, Technology, Engineering, and Math)** education is critical for the best of today's and tomorrow's jobs. Since the economic recession, the recovery has been concentrated on workers with STEM and information technology skills. Most STEM jobs do not require a four-year college degree and have a high payout. And if a worker has a degree in a STEM field their salary is much higher. In a STEM based economy, job growth, wages, patenting, exports, and employment rates are all much higher. Another positive factor is a larger concentration of these jobs means less income inequality.

Our students are more tech savvy than any previous generation with smart mobile devices and portable and home computer systems of their own. More and more homework assignments, grades, progress reports and communication between teachers, students and parents are provided online through the cloud or eLearning Management Systems. Students without home Internet access easily fall behind. Parents without home Internet access have difficulty monitoring their children's academic progress, though involvement in their children's education is one of the most important factors in their success.

In a March 7, 2012, letter to Arizona State Legislators, Arizona Superintendent John Huppenthal stated: "The minimum speed that is educationally sufficient to support ADE's transformational plans is 6 Megabits per second per student. This speed enables uninterrupted video streaming and rapid downloads of education content whether a student is at home or at school". However, this Internet service speed offering is only available to 72% of rural areas and 57% of sparsely populated rural areas in the State. Until this deficit is corrected in rural areas, statewide plans for educational transformation cannot be fully implemented.

Thus, at the state and local level, we must seek to facilitate the implementation of underlying technologies, digital curricula, collaboration, and professional development to promote improvements in education and workforce development while serving the needs of a rapidly evolving statewide data based decision support system.

The Governor's AZ Ready program and recent budget are reforming state education through the implementation of the **Common Core State Standards** (<http://www.corestandards.org/>) and associated standardized **Partnership for Assessment of Readiness for College and Careers (PARCC** - <http://www.parcconline.org/>) testing, upgrading classroom technology, and implementing a performance-based funding model to reward academic success. To support these goals, the **State Educational Technology Directors Association (SETDA** - <http://www.setda.org/>) recommends that all K-12 schools and districts meet the following minimum broadband targets between now and the 2017-2018 school year, as well as reach the goal of universal broadband access by students and educators outside the school:

Broadband Access for Teaching, Learning and School Operations	2014-15 School Year Target	2017-18 School Year Target
An external Internet connection to the Internet Service Provider (ISP)	At least 100 Mbps per 1,000 students/staff	At least 1 Gbps per 1,000 students/staff
Internal wide area network (WAN) connections from the district to each school and among schools within the district	At least 1 Gbps per 1,000 students/staff	At least 10 Gbps per 1,000 students/staff

On June 6, 2013 the White House unveiled a bold, new initiative called ConnectED to connect 99 percent of America's students to the internet through high-speed broadband and high-speed wireless within 5 years, calling on the FCC to modernize and leverage its existing E-Rate program to meet that goal. The President also directed the federal government to make better use of existing funds to get Internet connectivity and educational technology into classrooms, and into the hands of teachers trained on its advantages. And he called on businesses, states, districts, schools and communities to support this vision. This ambitious initiative does not require Congressional action. ConnectED also better invests existing federal funds to ensure that every educator in America receives support and training in using education technology tools to improve student learning.

Improving Healthcare with Technology and Telemedicine:

Healthcare is 18% of our nation's GDP and will cross 20% before 2020. In 2040 there will be twice as many Americans over 65 as there are now. Three-quarters of America's health costs are for chronic conditions. There will be even greater physician shortages as this generation of doctors is retiring, especially in America's rural areas. Twenty-five years ago all a doctor needed was a telephone with dial tone. Today a doctor needs enough bandwidth for real-time collaboration while viewing MRIs.

Health Information Technology (HIT) can reduce costs, increase physician productivity, and improve care by enabling near real-time access to patient records, giving rural patients remote access to medical specialists in urban areas, and is critical for appropriate, cost-effective, medical decision making. HIT plays a key role in advancing policy priorities that improve health and health care delivery including improving care quality, safety, efficiency, and reducing disparities. It can also enhance care coordination, engage patients and families in managing their health, and with remote monitoring, enable the aged and infirm to stay in their homes longer and enjoy a better quality of life.

Deployment of statewide efforts to increase electronic medical record (EMR) adoption and health information exchanges (HIE), rely on robust digital capacity for hospitals, medical offices, and our homes that is often lacking in rural and even urban environments. Thus, we must act in concert to facilitate the expansion of a robust statewide telehealth ecosystem and the implementation of a shared vision, strategic plan, and sustainable business model for the health network.

A critical element is the removal of barriers for appropriate reimbursement by health plans. This past session, Arizona passed a significant piece of legislation related to broadband in rural areas, SB 1353, the telemedicine parity bill. It requires private health insurers to provide coverage in rural communities for services delivered via telemedicine at a comparable rate to those provided in person. Services covered include trauma, burns, cardiology, infectious diseases, mental health disorders, neurological diseases and dermatology. Significant collaboration between healthcare stakeholders and telemedicine interests built a coalition and solid support for the bill.

The Arizona Health Information Exchange (HIE)



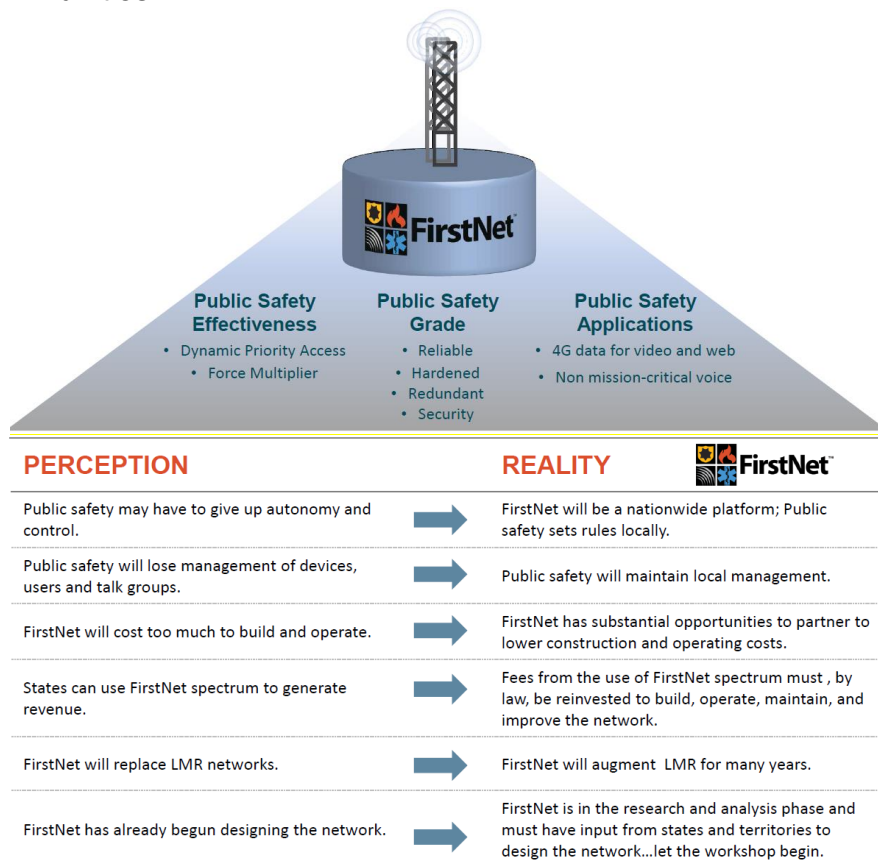
Source: Arizona Governor's Office of HIE Exchange (2010)

Public Safety Communications

Telecommunications has long been at the core of first responders' ability to operate, prevent emergencies, and respond swiftly when they occur. Mobile devices and broadband services can also provide the public timely and pervasive emergency information and assistance as well as new ways of calling for help. Unfortunately, the U.S. has not yet realized the potential of broadband to enhance public safety. Today, first responders from different jurisdictions and agencies often cannot communicate during emergencies. Emergency 911 systems still operate on circuit-switched networks. Similarly, federal, Tribal, state and local governments use outdated alerting systems to inform the public during emergencies. The U.S. also faces threats to the resiliency and cyber security of its networks.

The entire public safety communications landscape changed dramatically in 2012 with the passage of legislation creating the First Responder Network Authority (FirstNet) that will be responsible for the creation and maintenance the National Public Safety Broadband Network (NPSBN). States are working with FirstNet to develop the definition of requirements for their state's portion of the NPSBN and prepare a plan for the state's portion of the buildout. The network is required to be self-supporting following a fee-based business model and will provide ample opportunities for the sharing of both spectrum and hardware (tower space, conduit, etc.) in public/private partnerships.

Because of the passing of SB 1402, ASET's SBDD program is cooperating with ADOA's Public Safety Interoperable Communications (PISC) Office which has responsibility for FirstNet planning and outreach. This office also reports to the state CIO and is exploring the possibility of using SB 1402 and the mapping data generated by DAP for potentially lower FirstNet costs of expanding rural backhaul infrastructure for use by FirstNet while sharing those expanded resources to benefit educational, healthcare, and economic development uses in rural communities.



Positive Trends and Portents for Broadband Evolution:

The modern world has truly embraced the many blessings of high-speed connectivity to our homes and offices, as well as to our mobile life on the go. Fortunately many societal, market, and technological factors strongly align with and are driving increasing investment in broadband infrastructure and services. Some of them are briefly summarized as follows:

Industry and Market Broadband Trends and Portents:

- **Smart Phone & Device Penetration, Mobile Apps Explosion, and Social Media**
- **Strong Mobile Industry Investment in 4G Wireless Infrastructure and Capabilities**
- **New Middle Mile Fiber Projects Driven by Mobile Requirements and FirstNet**
- **Enterprise/Business Models, Processes, and Need for Real-time Collaboration**
- **Business to Business (B2B) and Business to Consumer (B2C) eCommerce**
- **Advent of Virtualization and Cloud Services for Applications, Content & Storage**
- **Continuously Increasing Consumption of Rich Media at Home and at Work**
- **Internet of Things and Machine to Machine (M2M) Communications Connecting Our World at an Ever Deeper and More Real-time Level**

National Broadband Trends and Portents:

- **Connect America Fund and Universal Service Funds (USF) for Broadband**
- **ConnectED to Complement Educational eRate for Common Core Readiness**
- **Connect2Compete and Other Non-Profit Broadband Initiatives and Philanthropy**
- **USDA Broadband Grants and Loans Continue**
- **FirstNet Public Safety Broadband Funding and Partnering Opportunities**
- **Libraries and Community Anchor Institutions Providing Broadband Support**
- **FCC Spectrum Reform and Market-Driven Regulatory Evolution**

Arizona Broadband Trends and Portents:

- **NTIA Broadband Grants for Mapping, Planning, and Projects**
- **Digital Arizona Program (DAP) and Digital Arizona Council (DAC)**
- **Arizona Broadband Map Portal and Community Planning Demographics/Tools**
- **GovNET/SACCNet and Other BTOP Grants for Rural Network Infrastructure**
- **SB 1402 Enabling State Highway ROW Utilization for Fiber Deployment**
- **SB 1353 Telemedicine Parity Bill for Rural Telehealth Payment Enablement**
- **Strong Non-Profits in Telecom and Technology Community with Policy Influence**
- **Arizona's Growing Technology Industries, Especially A&D, Biotech & Cleantech**

There's a lot going on technically, in the marketplace, and across the regulatory landscape driving both increased broadband requirements, as well as available coverage and increases in speed, but remember, hope (alone) is not a strategy. And as the Rural Telecommunications Congress (RTC) principles open with, failing to plan is planning to fail.

For your communities and stakeholders in traditionally underserved rural areas to "keep up" or even exceed the averages for broadband availability and performance in the U.S., let alone the world, they must be an active and positive participant in encouraging broadband investment and optimizing its impact and use.

Community Planning Guidelines and Recommendations:

The Rural Telecommunications Congress (RTC) is a national membership organization dedicated to assuring that rural areas in the United States have access to the information and support they need to obtain and use advanced telecommunications services and technology for social and economic development. RTC has defined the following principles they consider to be the fundamental truths for effective community broadband planning. RTC believes that the application of these principles will result in much greater availability and benefits for broadband, higher performance, lower total costs, and higher overall return on investment.

- **Failing to plan is planning to fail.** Broadband is critical infrastructure for prosperity in the 21st century, and it should be planned accordingly.
- **The purpose is to improve economic opportunities and quality of life.** Broadband planning should focus first and foremost on these ends.
- **"Adequate" broadband is not adequate.** Broadband planning should result in abundant, reliable bandwidth and unfettered connectivity, and should make the most of technological change.
- **People and places are different, and each is important.** Broadband planning should accommodate differences between places by actively involving local community leaders, community members, providers, and other stakeholders in making decisions based on good data.
- **Leaders must be educated and engaged.** Broadband planning should engage private and public leaders at all levels. It should educate elected officials and other leaders about how and why broadband is critical, and should encourage them to become supporters and users.
- **Break down the silos.** Broadband should electronically connect all community domains and sectors (business, government services, education, public safety, etc.) to promote the exchange of information and tie community processes together
- **How it is used and who uses it is as important as what it is.** Broadband planning should be as concerned with adoption, applications, and processes, as with physical assets needed to build broadband networks.
- **Develop new ways of doing business.** Broadband planning should consider new business models and other innovations for developing, deploying, operating, and utilizing broadband, and should not assume that old models and practices are best.
- **Provide a catalyst for prosperity.** Broadband planning should foster development of and facilitate investments by users as well as providers, rather than just capitalizing on consumer demand for entertainment and passive recreation.

The above principles, developed and promoted by the RTC, are sound, well stated, and quite relevant to the WACOG broadband community planning processes and initiatives.

Before effective community planning can be achieved it is imperative to understand the current broadband capacity as compared to the targeted desired environment. A good starting point is for each community to conduct a gap analysis. Gap analysis is a frequently used tool that helps identify the gaps between a current situation and a future state that is a goal, along with the tasks needed to complete and close the gap.

WACOG is ideally situated to oversee local community-oriented or region-oriented gap analyses since it consists of local decision makers including elected officials, business leaders and community leaders. WACOG also plays a key role in helping to determine the buildout of state highways in its three-county region. This is ideal since the recent enactment of the Arizona Digital Highways bill (SB 1402) allows digital conduit to be built along Arizona's state highways.

Conducting a gap analysis will help a community or region to:

- Consider its current situation.
- Identify and review previous efforts, studies and output from area stakeholders.
- Determine its current digital capacity for broadband.
- Establish a target (i.e., analyze where it wants to be).
- Determine the capacity that is required to reach that target.
- Determine deficits (gaps) between its current digital capacity and the target,
- Suggest strategies and tactics that will get them to the target.

The gap analysis process requires significant levels of communication, collaboration and engagement to gather data about the current status of broadband services, including:

- Open forum style meetings for businesses to provide information about their uses of and needs for broadband.
- Meetings to gather input and support from municipal officials throughout the community or region.
- Public meetings with a target audience of citizens from the poorly served areas.
- An invitation to hundreds of area businesses to participate in an online survey regarding needs.
- Brief interviews with businesses located in business parks and a physical review of observable facilities in business parks.
- Additional phone call interviews with WACOG's largest businesses.
- A survey mailed to residents regarding service quality.
- A polling of the Internet Service Providers (ISPs) to request and obtain information about offerings, prices and coverage areas.

Community Planning Guide Outline:

The next step is to develop a plan for going forward, based upon the input received from the above process. Such a plan for expanding broadband services and improving Internet service to WACOG's citizens, businesses and government is represented below as a Community Planning Guide Outline.

1. Understand fundamental user requirements - these requirements are focused on four major application areas:
 - a. Economic development (jobs) and economic sustainability.
 - b. Education - expansion of distance learning, self-paced learning, and real-time testing and accountability.
 - c. Telehealth - using technology to lower costs, improve care, and enhance quality-of-life for rural residents.
 - d. Public Safety - delivery of real-time information and communication to ad-hoc groups of first responders as needed per event.
2. Obtain local stakeholder buy-in regarding
 - a. The nature of the problem regarding broadband capacity and the desired solution.

- b. The willingness to pay for and to work toward a common aggregated solution.
 - c. The cooperation of local government entities to facilitate shorter permitting times, standardized zoning practices, lower fees, rights-of-way (ROW) access and integration with other projects.
 - d. The identification of potential private sector partners and investors.
 - e. The willingness to augment private funding with grants, loans, etc.
 - f. The identification of “must have” and “nice to have” project goals.
3. Identify constraints and costs for providers to expand broadband capacity
- a. ROW and environmental requirements
 - b. Utility clearances as well as completion of environmental/cultural impact studies.
 - c. Potential areas of cooperation with providers from regions and local communities that can have significant positive impact on the return-on-investment (ROI) calculations to facilitate and encourage such investments by providers. For example, cities and towns control resources. They can emphasize fees and tax revenues, but they can choose to be more accommodating to potential and current providers, such as having low permitting and low or no use fees, giving ROW away or at least making it easy to utilize commercially.
4. Define community/provider project tasks
- a. Solidify community-wide demand aggregation with conditional pledges to purchase new capacity when available.
 - b. Determine property ownership and clearances if required for new construction
 - c. Obtain rights-of-way easements if and when required
 - d. Obtain environmental and cultural clearances if and when required
 - e. Advocate middle-mile infrastructure sharing among last-mile service providers
 - f. Find ways to Interface with and expand current infrastructure wherever possible
 - g. Identify and promote/require redundancy/interoperability solutions with middle-mile service providers.
5. Develop a project planning action plan:
- a. Create a problem and mission statement, a tactical plan (including financing options), a project budget(s), a process flow chart and timeline, draft provisional stakeholder term sheets reflecting commitments and success metrics.
 - b. Develop specific action-plans, identifying leaders, planners, broadband providers, technical consultants, including assignments and schedules (milestones), to meet the goals/objectives of identified projects.
 - c. Secure pledges of support from the stakeholders.
 - d. Communicate with potential investor/providers about desired projects to discover in detail the barriers that might prevent them from investing in an identified project.
 - e. Explore ways to mitigate possible barriers through partnerships and cooperative arrangements. Communities and stakeholders must distinguish the “Must Haves” from the “Like to Haves” in proposed projects in order to control costs and resources and to encourage investment.
6. Identify and agree upon major milestones and expected accomplishments. Determine how success will be measured.
- a. Leadership and Planning are essential for the success of any project.
 - b. Identify the leaders and advocates in each community for each project
 - c. Communicate with all leaders in the community and leaders in other communities frequently to learn about best practices and keep the project momentum high.
 - d. Track progress and take corrective actions that may be needed from time to time.

Understanding and Changing the Broadband Investor Equation:

A key element of the planning process is to initiate and maintain a dialogue between community stakeholder groups and broadband providers to grasp the salient issues and to strategize path(s) forward. One method to employ is to modify the investment equation to incentivize network providers to become engaged. Blair Levin developed a concept intended to drive and improve the “network investor equation.” Mr. Levin, who formerly served as Chief of Staff to FCC Chairman Reed Hundt in the 1990s, is currently the Executive Director of Gig.U, an organization that seeks to accelerate the deployment of ultra-high-speed networks to leading U.S. universities and their surrounding communities. Mr. Levin’s formula shown below is intended to show how digital providers and policy makers can influence the factors involved in creating a positive return on investment in areas where providing digital connectivity can be challenging, such as in the WACOG communities and rural Arizona in general. By using the strategy of demand aggregation in areas of need it becomes feasible to alter the network investor equation.

Reducing ROW costs and time to market leads to a lowering of capital expenditures (Cap Ex). Co-location of towers reduces capital expenditure requirements for digital providers. Aggregating demand through anchor tenants as digital customers increases digital provider revenues. Further recommendations below positively impact this formula for digital providers.

The Broadband Network Investor Equation

Costs

Benefits

$$C + O > (1-r)R + SB + (-CL)$$

Changing the Broadband Network Investor Math



$$C + O < (1-r)R + SB + (-CL)$$



Network Investor Equation Definitions:

C - Capital Expenditures

O - Operating Expenditures

r - Risk

R- Revenues

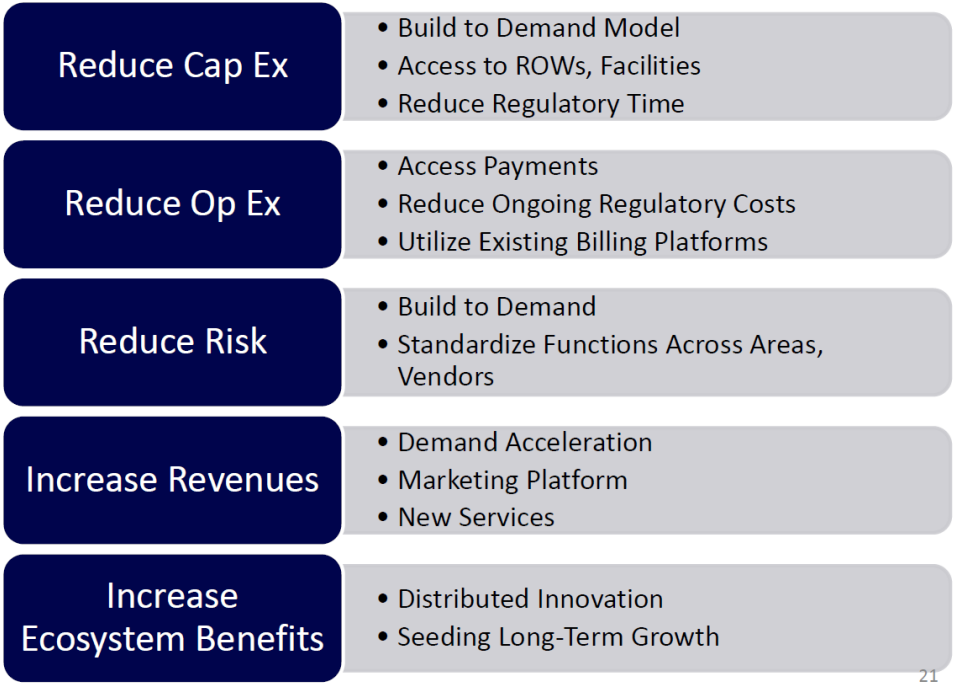
SB- System Benefits (Benefits that drive increased revenues outside the communities where the new or incremental investments are made.)

CL- Losses due to competition

Source: Blair Levin, Executive Director, Gig.U & former Director of the FCC National Broadband Plan (Levin, How Community Efforts Can Change the Math, 2012)

By communicating with providers, users and local government entities communities can do a great deal to facilitate a change in the math that determines network investment. Capital expenditure can be reduced by focusing on what is needed by potential users, providing cost effective access to ROW and reducing the time to get regulatory approvals. Operating expenses can be minimized by focusing on access payments, bringing down the fees for ongoing regulation and wherever possible using billing mechanisms that are already in place. Risk can be mitigated by building only what is needed and standardizing as many functions as possible across regions and vendors. The above actions will lead to an acceleration of demand allowing for the development of marketing platforms and new services. The overall benefits will be the distribution of innovative solutions and long-term growth and sustainability. See the chart below for a representation of this process.

How Community Efforts Can Change the Math

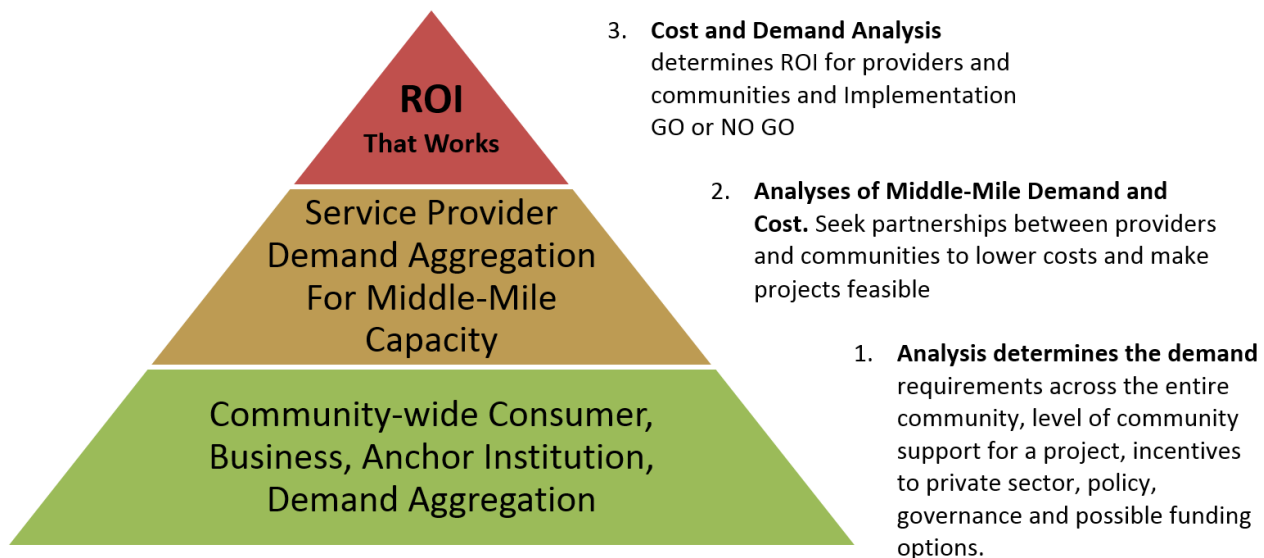


Source: Blair Levin, Executive Director, Gig.U & former Director of the FCC National Broadband Plan (Levin, How Community Efforts Can Change the Math, 2012)

Demand Aggregation:

To improve the likelihood of expanded broadband investment being made in a particular community or region an analysis for demand aggregation potential should be undertaken. Identification and quantification of increased potential demand along with identified ways to lower (or offset) planning and construction costs are necessary ingredients for incentivizing the private sector to make investments they might otherwise not be prepared to make. An important issue to examine is how to combine multiple existing single network connections into a larger pool of connections that can share the resources of an expanded infrastructure.

Community Demand Aggregation means the inclusion of stakeholders (business, government, anchor institutions and residents) to quantify a greater demand for broadband services. Communities can obtain binding pledges from Community Anchor Institutions (CAIs) to purchase improved broadband services conditional on their availability on pre-determined terms. Communities may also look for funding streams to offset a portion of the costs that would normally be borne by private investors.



Service provider aggregation means sharing capacity among providers (especially middle-mile capacity). Design and construction costs can be lowered with alternate funding streams including revolving loans, Community Reinvestment Act (CRA) initiatives, USDA Broadband projects and making community physical assets and ROW available at or near cost.

Pledges of Support:

An innovative method for leveling the playing field, creating Internet access parity between rural and urban communities, and benefiting the private sector providers involves securing pledges of support from the various stakeholders. This can be accomplished at the community level at no additional cost to taxpayers and is illustrated below as a cycle of pledges. The stakeholders in this process include the community institutional users, local government entities, broadband providers, Arizona state government agencies, banks and investment institutions, and end users.



An enhanced ROI model for the provider(s) and a community's commitments will help to ensure success and sustainability of any new broadband infrastructure investments. And securing pledges of support as commitments to use newly available broadband services can go a long way in favorably shifting potential providers' calculation of investment risk and ROI.

Some Practical Options:

Below are some practical short-term options available to WACOG that could lead to a substantial improvement in broadband access.

Educate and coach the counties and WACOG communities to help businesses and residences by providing information to the public about existing options. Such actions include holding public informational meetings and distributing reports such as this one. WACOG should also publish selected portions of such reports, with maps and tables, on its website. Another viable option is to prepare a concise "brochure" for residents about broadband and distributing it within mailings required for other purposes.

Encourage counties and communities that own or have access to towers and water towers for public safety purposes to identify those towers that are open for use by commercial entities. They could then maximize providers' coverage and bandwidth by offering space on available towers to wireless providers at affordable prices to encourage expansion of their coverage areas.

Strive to expand broadband coverage by meeting with current and prospective providers to review the coverage maps contained in the "WACOG Broadband Technical Report" showing known poor or non-existent coverage areas. The Arizona Community Planning Broadband Map at <http://broadbandmap.az.gov/CommunityPlanningMap/> contains a good deal of additional relevant information. Then encourage those providers to specifically target those areas for expanded coverage. One avenue for expanding coverage might include working with providers to apply for grants and loans to improve middle mile bandwidth. See the "WACOG Broadband Grants Guide" for more details. Urge residents to use the speed tests found at http://www.digitalarizona.gov/Maps/Arizona_Broadband_Maps.html so that WACOG can gain a better understanding of what levels of broadband service is available in the three counties.

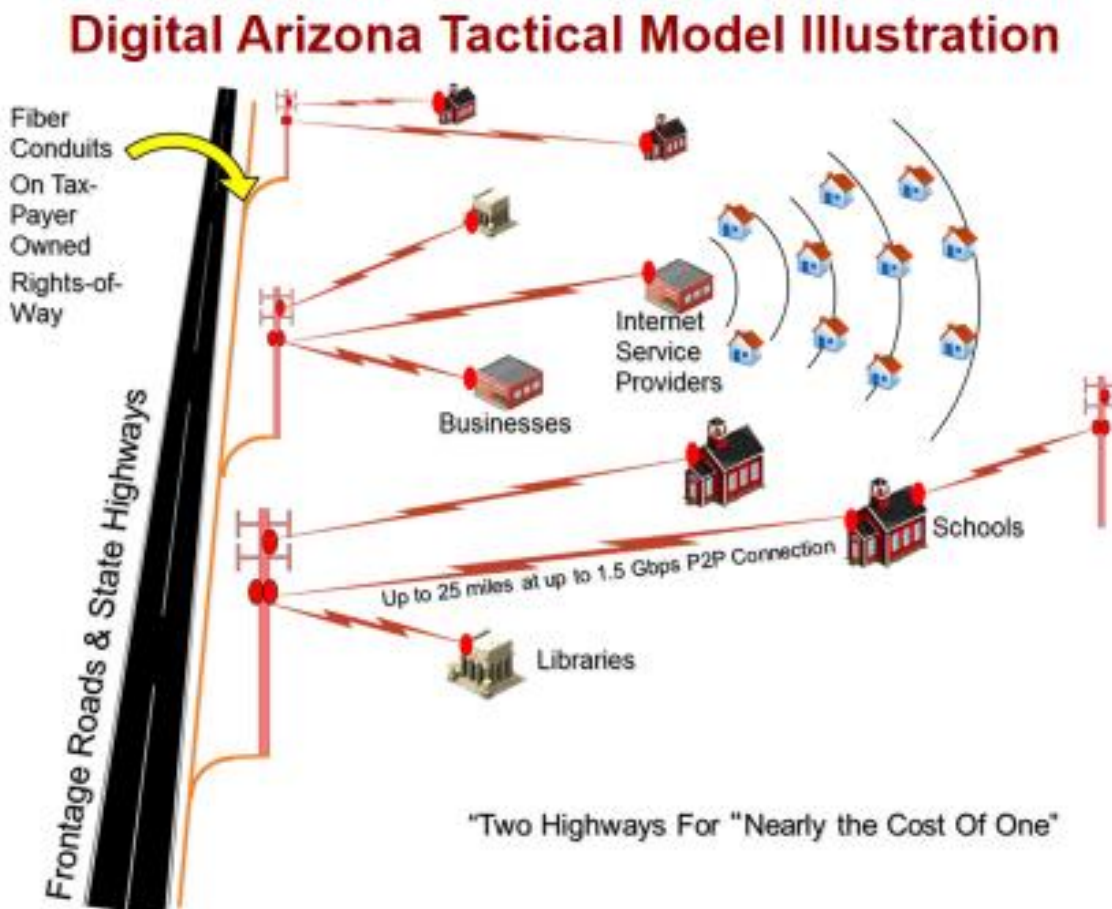
Enhance public access to the Internet via active support of library, school and non-profit entities that plan to improve access to broadband or to provide computers for disadvantaged residents. Examples of such supportive actions include providing meeting rooms for training classes; establishing a volunteer service program in which participants assist with training classes and in setting up computers; supporting community-led initiatives to train and educate members of the community on how to use broadband and the Internet effectively; and encouraging local businesses to donate computers and to volunteer their services to support sustainable broadband adoption.

Identify grant and loan projects by collaborating with public-service entities, including neighboring counties, technical colleges, healthcare organizations and K-12 school districts. Each of these entities has valid reasons to promote more available and affordable broadband services and each has resources or assets to bring to the table. Healthcare organizations have qualified staff that could conduct remote "house calls" for homebound patients; but this requires reliable, high capacity broadband connectivity to the home. K-12 districts want to ensure that students have quality Internet access at home as more and more course material is now available only online. Those districts have land and buildings that could be used to host network equipment sites.

Explore the possibility of partnering with local incumbent phone companies. Many residents in rural areas are served by a variety of smaller carriers. These companies are often constrained by the availability of capital to expand or upgrade their systems especially in this tight capital market. There may be opportunities for WACOG to partner with these smaller providers with regard to grant opportunities. If opportunities to partner with these companies do exist, then WACOG has the potential to significantly upgrade the service offerings by deploying government or shared assets for them to use in these rural areas.

Investments must be made in the WACOG region by the private sector and communities to improve broadband functions and features. Communities should explore various funding opportunities available only to governments and non-profit organizations to augment private sector investment. Internet accessibility is critical for businesses, schools, telemedicine and public safety. Businesses must be able to reduce operating costs by deploying efficient systems through exploiting the power of the Internet including shipping/receiving logistics, purchasing power and customer service. These companies rely upon high capacity broadband to service their customers and efficiently run their businesses.

An example of a tactical model being considered in Arizona where middle mile fiber deployed in highway ROW feeds towers from which mobile and fixed wireless broadband can be distributed to nearby communities and populations is shown below.



Source: Arizona Strategic Enterprise Technology Office (ASET)

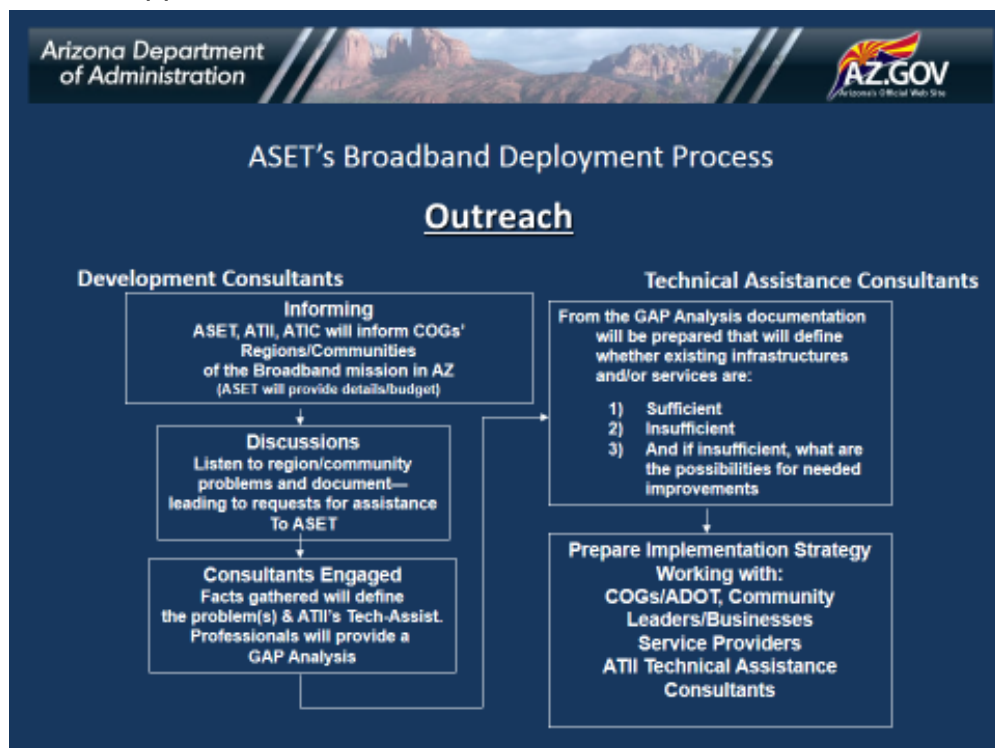
WACOG Broadband Business Case Analysis (BCA) Process:

A portion of the State's five year NTIA Broadband Grant is targeted to supporting Community Broadband Planning and Technical Assistance in Arizona's rural areas. ASET in partnership with the Arizona Telecom & Information Institute (ATI Institute) is working with WACOG to establish and coordinate broadband-related programs, as well as provide consultants and support for several important actions to build the organizational capacity needed to support the development and implementation of the Business Case Analysis (BCA).

- The WACOG Broadband Steering Committee was formed with broad participation among regional economic development, educational technology, transportation, government IT, healthcare, and public safety stakeholders.
- The WACOG Broadband Steering Committee had significant facilitated dialogue regarding regional broadband gaps and issues, as well as potential strategies and tactics to ensure that the region has adequate bandwidth.
- The creation of WACOG web content (<http://www.wacog.com/wacog-broadband-steering.html>) to communicate to the community and stakeholders about broadband activities across the region to foster community engagement.
- The identification of potential grants that could be applied for and a Broadband Grants & Resources Guide to support increased availability and/or more effective use of broadband connectivity in local communities.
- The development of community profiles with a wealth of economic and broadband information and resources in spreadsheet form for use on the State map portal.

Under the same grant, the consultants are also providing regional Broadband Technical Assistance including:

- Gap analysis including Broadband Services Availability and Broadband Infrastructure Availability
- Detail broadband applications and their applicability to Regional Rural Broadband Related Job Opportunities



The first step was for International Research Center consultants to engage WACOG's Executive Team and the ASET/ATII project management consultant. This was accomplished by meetings and correspondence with the core team and obtaining consensus and endorsement for plans regarding the Broadband Steering Committee's goals, formation, logistics, and membership. The next step involved presentations to the WACOG Executive Committee and getting their buy-in. This was followed by outreach and engagement of potential Broadband Steering Committee members and their other recommendations for participation.

A series of maps and an inventory of available broadband providers and services and infrastructure was produced utilizing a variety of resources including the biannual broadband provider data sets collected by ASET and available through the Digital Arizona Broadband Community Planning Map as well as the use of other analytic and GIS processing. Ten communities within the three WACOG counties were further analyzed, including available broadband providers and their reported service speeds based on data from the map.

This was combined with a variety of demographic data from U.S. Census data, a number of State of Arizona agencies, the Arizona Commerce Authority, city-data.com, and other statistical sources. Initial inputs were gathered from community members, businesses, local governments, and community anchor institutions which when further refined in the future will become the ingredients for potential broadband demand aggregation. Benchmark broadband speed test results for the region were collected and analyzed, to be augmented by additional testing capabilities coming online going forward. Further, State and regional transportation departments augmented by broadband map analysis identified routes and locations where infrastructure assets are currently available and where there are needs and opportunities to increase digital capacity. All this information can provide fundamental guidance in the process of planning for where to focus on increased capacity and service needs.

By determining not only the current availability of digital services within the three counties and creation of a composite picture of each community's demographic and socio-economic makeup, the WACOG Broadband Steering Committee will be able to generate the rationale for why and where additional digital capacity and services are most needed within the various WACOG sub-regions and localities, as well as develop location and situation appropriate strategies and tactic.

Thus this WACOG Broadband Business Case Analysis (BCA) has been prepared stressing community planning analysis, guidelines, and recommendations. The foundation of the document uses the inventory described above for current broadband services to identify current digital capacity capabilities and limitations. It presents what is required by the stakeholders and regional/community leaders to enhance and upgrade competitive infrastructure to support economic development/jobs, education, telemedicine, and public safety. Broadband infrastructure deployment projects and private sector partnerships and private sector solicitations will be based upon demand analysis and sometimes identified urgencies. WACOG communities will continue to focus on the benefits of broadband and how it can further enhance the region's economic vitality and quality of life.

WACOG County Overviews and Broadband Gap Analysis:

WACOG Region Overview:

Arizona's Rural and Urban Councils of Government (COGs)



The **Western Arizona Council of Governments (WACOG - <http://www.wacog.com/>)** is a nonprofit membership corporation representing local governments and providing a wide variety of services within the three rural Arizona counties of Yuma, La Paz, and Mohave along the western edge of the State. These three counties consist of a total of 23,325 square miles representing 21% of the State with 423,637 residents representing just 6.5% of the State's population (2012 estimate).

The other three rural COGs are Central Association of Governments (CAG) covering Pinal and Gila counties, Northern Arizona Council of Governments (NACOG) covering Coconino, Apache, Navajo, and Yavapai counties, and the Southeastern Arizona Council of Governments (SEAGO) covering Santa Cruz, Cochise, Graham, and Greenlee counties. The two primarily urban COGs are the Maricopa Association of Governments (MAG) and the Pima Association of Governments (PAG), neither of which are considered rural.

Within the WACOG region, each county and community has different demographic profiles, workforce characteristics, broadband gaps, and opportunities to focus on regarding achieving additional broadband capacity and utilization. A brief summary of each counties' unique profile and challenges follows.

WACOG Broadband Gap Analysis Overview:

To recognize where WACOG needs to place emphasis on broadband capacity development, it was necessary to first determine what is currently available within WACOG's territory and perform a gap analysis. WACOG three counties cover the western edge of Arizona consisting of a total of 23,325 square miles with a population of 423,637 (2012 estimate). Investigative research focused on demands for economic development, education, telemedicine, and public safety stakeholders within each region/community, in which it was discovered that the WACOG region has significant gaps in broadband availability, coverage, provider diversity, and performance. The region most definitely requires additional and enhanced broadband service offerings to be able to attract and sustain economic development programs (jobs, education/skill-sets), as well as meet regional educational, medical, and public safety services needs today and increasingly for its future. Several current data resources were utilized to determine the existing digital capabilities for the area and major population centers.

The purpose of the Arizona Broadband Assessment Project (AZ BAP) is to identify both the availability and speed of broadband services, and the location of broadband infrastructure throughout Arizona, including middle mile infrastructure and Community Anchor Institutions (CAIs). This project is provided through the American Recovery and Reinvestment Act of 2009 (ARRA) and the Broadband Data Improvement Act (BDIA), and in conjunction with the National Telecommunications and Information Administration (NTIA) and the Federal Communications Commission (FCC). AZ BAP is managed by the Arizona Strategic Enterprise Technology Office (ASET) under the Arizona Department of Administration (ADOA) in partnership with the Arizona State Land Department (ASLD), contractor Data Site Consortium, Inc. and their GIS subcontractor, TerraSystems Southwest (TSSW).

AZ BAP has been collecting detailed broadband coverage and speed data from Arizona's broadband providers since 2010 and the latest data set for Spring 2013 is current as of December 31, 2012. Arizona State Land Department (ASLD) maintains the related Arizona Broadband Map at <http://broadbandmap.az.gov/map/> loaded with the last broadband data set. There is also a special Community Planning version of the broadband map available at <http://broadbandmap.az.gov/CommunityPlanningMap/>, loaded with demographic data and special analysis tools that will aid community broadband analysis and planning. These tools are designed to mutually serve both Arizona's broadband consumer helping lead them to broadband providers' offerings thus useful for the provider community in marketing and outreach, as well as to contribute to State and regional policy and strategic planning.

A variety of broadband speed test data is available to inform our State and regional analysis. The federal Consumer Broadband Test (<http://www.broadband.gov/qualitytest/about/>) results are regularly downloaded by AZ BAP and processed to help verify broadband providers' declared coverage. Arizona has recently launched its own speed test (<http://www.digitalarizona.gov/Survey/StandardInArizonaQuestion.html>) and results will be added to our analysis capabilities over time. Speed tests by speedmatters.org (<http://www.speedmatters.org/>) are readily accessible, but the quantity of tests performed to date does not yet rise to the level of statistical significance and may prove somewhat dated. Early results point to the fact that all the three counties are below or just nearly at the minimum FCC benchmark, (4 Mbps Down and 1 Mbps Up) and nowhere near the Educationally Sufficient benchmark of 6 Mbps (up and down) established by the State Superintendent of Education. County-by-county demographics and analysis follows and county-level employment estimates breakdown and detailed broadband availability statistics by technology type can be found in Appendix C. More detailed broadband and infrastructure maps may be found in the complimentary **WACOG Broadband Technical Report**.

Yuma County Overview and Broadband Gap Analysis:

Yuma County is in the southwestern corner of the State of Arizona with the City of Yuma as its county seat. Much of Yuma County's 5,519 square miles is desert land highlighted by rugged mountains. The valley regions, however, contain an abundance of arable land, which is irrigated with Colorado River water. The U.S. Bureau of Land Management accounts for 42 percent of land ownership; Indian reservations, less than 0.5 percent; the State of Arizona, 5 percent; individual or corporate, 13 percent; and other public lands, 40 percent.

Agriculture, forestry, tourism (including hunting and fishing), military, and government are the county's principal industries. Some 29% of employment is in the government sector versus 15% statewide. Unemployment is quite high, running 34.5% versus 8.3% statewide as of July 2013. During the winter months, the population grows considerably by an estimated 90,000 with part-time residents sometimes known as "snowbirds". All of Yuma County is an Enterprise Zone.

Logistics and distribution is a major industry with the City of San Luis and its associated Port of Entry, an official CANAMEX Corridor entry point accessing safe and efficient multi modal transportation networks to Mexico and Canada. Major highways include Interstate 8 and U.S. Route 95.

The Yuma area has a very strong commercial and military aviation infrastructure and associated economic activity with a significant military and aerospace & defense industry presence. Aviation assets includes Yuma International Airport, the Marine Corps Air Station, and the U.S. Army Yuma Proving Ground. There is a possible pending federal award to Arizona of a major system of Unmanned Aircraft Systems (UAS) test centers including the Southwest Arizona UAS Test Range Overlay in the area, anticipated to drive substantial additional economic activity and growth.

	<u>Population</u>
Yuma County	205,174
Yuma (County Seat)	94,824
San Luis	31,080
Somerton	14,796
Welton	2,974
Unincorporated (Including the Cocopah Indian Reservation)	61,500

For additional Yuma County information see:

- Yuma County - <http://www.co.yuma.az.us/>
- Greater Yuma Economic Development Corp. - <http://www.greateryuma.org/>
- Yuma County Chamber of Commerce - <http://www.yumachamber.org/>
- Yuma County Wikipedia Entry - http://en.wikipedia.org/wiki/Yuma_County,_Arizona

Yuma County Broadband Gap Analysis:

- There is limited DSL coverage in Yuma County centering on the Greater Yuma area including Somerton with just a little coverage in the Welton area. Just 63.3% of the population can get DSL at ≥ 768 Kbps downstream and a slim 40.6% can get ≥ 6 Mbps. The Arizona broadband mapping team has discovered an issue in processing Frontier's DSL coverage and will make corrections in the pending Fall 2013 submittal, likely resulting in reporting of slightly less coverage.
- Cable modem based broadband covers 82.2% of the Yuma County population, again centering on the Greater Yuma area including some of Somerton and San Luis, with speeds ≥ 10 Mbps.
- Fixed wireless (licensed and unlicensed) has a more extensive footprint estimated to reach 95.0% of the Yuma County population in the Greater Yuma area and along the I8 corridor at speeds up to 6 Mbps, but is barely available (1.6%) at higher speeds.
- Mobile wireless has by far the broadest footprint, estimated to reach 100.0% of the Yuma County population at speeds ≥ 768 Kbps and virtually the same footprint at 98.9% for speeds up to 6 Mbps, but nothing higher.
- A limited number of Middle Mile points, almost always fiber fed, are available primarily from Airband Communications, Level3 Communications, CenturyLink, and Zayo.
- SpeedMatters.org reports 96 speed test results for Yuma County with an average download speed of 4,021 Kbps and upload speed of 425 Kbps versus Arizona-wide averages of 3186 Kbps download and 389 Kbps upload (and national averages of 3874 Kbps download and 877 Kbps upload).

The next round of Yuma County broadband community planning and technical assistance activities will focus on:

- The City of San Luis and its associated Port of Entry as the "hot zone" for WACOG border activity and hub for international transportation and logistics.
- The Yuma Area Aviation (Yuma International Airport, Marine Corps Air Station, U.S. Army Yuma Proving Ground, Southwest Arizona UAS Test Range Overlay) where there is a significant military and aerospace & defense industry presence with a pending national UAS test center anticipated to drive additional activity and growth.

Yuma County Selected Demographics

Baseline Demographics	Yuma County	State of Arizona
County seat/State capitol	Yuma	Phoenix
Land area in square miles	5,513.99	113,594.08
Population, 2012 estimate	200,022	6,553,255
Population, percent change, 4/1/10-7/1/12	2.2%	2.5%
Persons under 18 years, percent, 2012	27.2%	24.7%
Persons 65 years and over, percent, 2012	16.4%	14.8%
Persons per household, 2007-2011	2.67	2.64
Persons per square mile, 2010	35.5	56.3
High school graduate or higher, percent of persons age 25+, 2007-2011	71.9%	85.2%
Bachelor's degree or higher, percent of persons age 25+, 2007-2011	13.9%	26.4%
Per capita income in the past 12 months (2011 dollars), 2007-2011	\$18,778	\$25,784
Median household income, 2007-2011	\$41,441	\$50,752
Persons below poverty level, percent, 2007-2011	20.8%	16.2%
Homeownership rate, 2007-2011	70.4%	66.6%
Total civilian labor force, 7/13	96,485	3,017,815
Total employment, 7/13	63,226	2,766,640
Total unemployment, 7/13	33,259	251,175
Unemployment rate, 7/13	34.5%	8.3%

Employment by Category (July 2013 Estimates)	Yuma County by Population	Statewide by Population	Yuma County %	Statewide %
Total Nonfarm	47,600	2,453,900	100.0%	100.0%
Total Private Employment	33,700	2,088,300	70.8%	85.1%
Goods Producing	4,000	296,200	8.4%	12.1%
Mining and Construction	2,200	139,400	4.6%	5.7%
Manufacturing	1,800	156,800	3.8%	6.4%
Service-Providing	43,600	2,157,700	91.6%	87.9%
Private Service-Providing	29,700	1,792,100	62.4%	73.0%
Trade, Transportation & Utilities	8,600	482,600	18.1%	19.7%
Information	600	39,600	1.3%	1.6%
Financial Activities	1,300	183,200	2.7%	7.5%
Professional & Business Services	6,300	360,500	13.2%	14.7%
Educational & Health Services	6,900	369,700	14.5%	15.1%
Leisure and Hospitality	4,600	272,100	9.7%	11.1%
Other Private Services	1,400	84,400	2.9%	3.4%
Government	13,900	365,600	29.2%	14.9%
Federal Government	3,600	55,700	7.6%	2.3%
State & Local Government	10,300	309,900	21.6%	12.6%

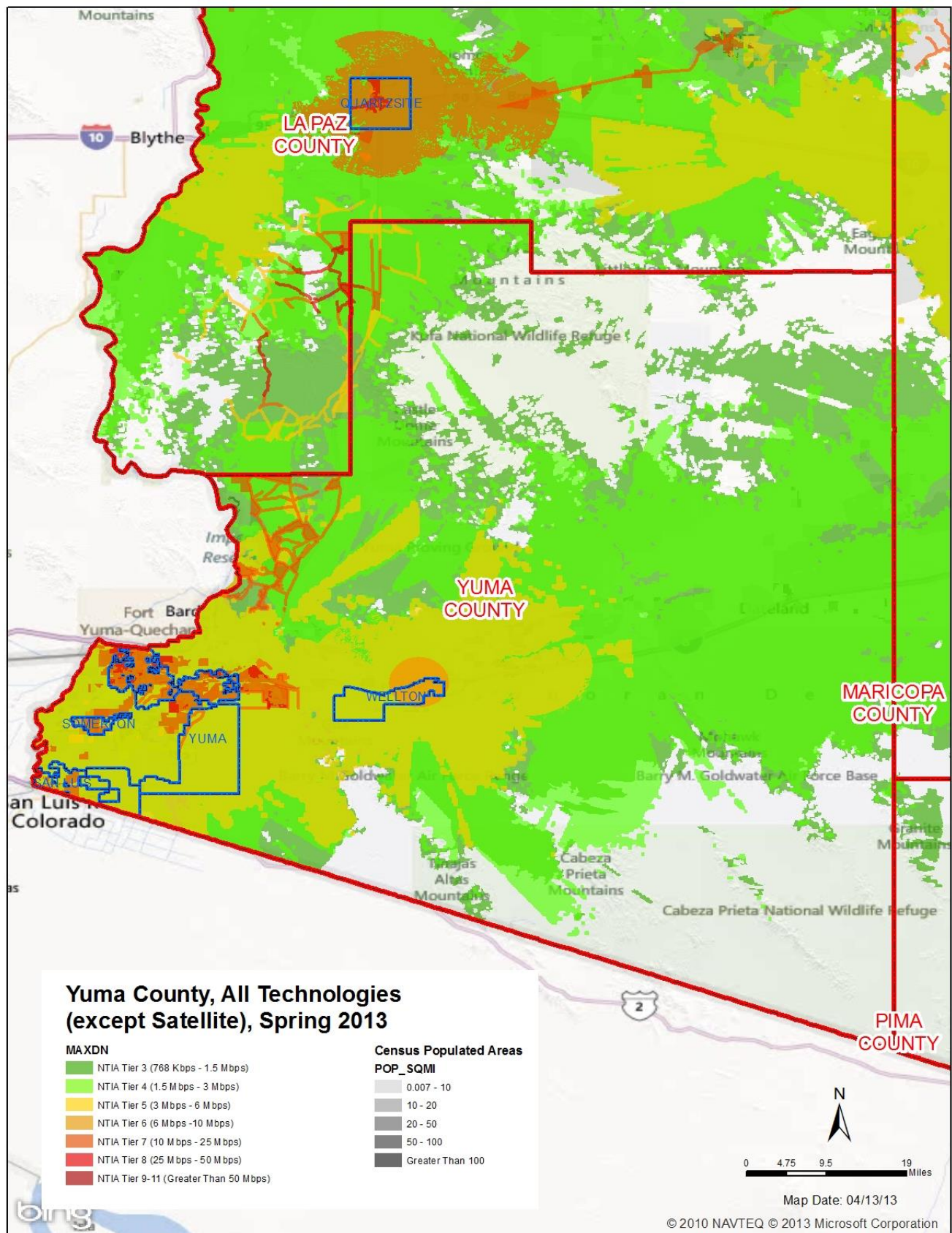
Sources: U.S. Census Bureau State & County QuickFacts (<http://quickfacts.census.gov/>) and ADOA Office of Employment & Population Statistics (<http://www.workforce.az.gov/>). For employment by category estimates, farm employment, private household employment, and self-employment are excluded and all employment statistics are non-seasonally adjusted.

Yuma County Broadband Coverage for Spring 2013

	Yuma County		State of Arizona	
All Broadband Tech (Except Satellite)	Population	Household	Population	Household
≥ 768 Kbps Down	100%	100%	99.5%	99.5%
≥ 3 Mbps Down	99.1%	98.75%	97.8%	97.5%
≥ 6 Mbps Down	84.2%	86.1%	95.6%	95.2%
≥ 10 Mbps Down	82.4%	83.3%	95.1%	94.6%
DSL, xDSL & Other Copper Tech	Population %	Household %	Population	Household
≥ 768 Kbps Down	63.3%	62.4%	93.1%	92.8%
≥ 3 Mbps Down	50.0%	47.8%	87.2%	86.4%
≥ 6 Mbps Down	40.6%	39.1%	79.9%	78.4%
≥ 10 Mbps Down	27.9%	26.8%	70.1%	68.4%
Cable Modem Technologies	Population	Household	Population	Household
≥ 768 Kbps Down	82.2%	83.2%	89.3%	88.7%
≥ 3 Mbps Down	82.2%	83.2%	89.3%	88.7%
≥ 6 Mbps Down	82.2%	83.2%	89.2%	88.6%
≥ 10 Mbps Down	82.2%	83.2%	89.2%	88.6%
Fixed Wireless Technologies	Population	Household	Population	Household
≥ 768 Kbps Down	95.0%	95.8%	94.7%	94.5%
≥ 3 Mbps Down	95.0%	95.8%	62.0%	62.9%
≥ 6 Mbps Down	1.6%	2.6%	34.8%	34.9%
≥ 10 Mbps Down	0%	0%	5.4%	5.4%
Mobile Wireless Technologies	Population	Household	Population	Household
≥ 768 Kbps Down	100%	100%	98.7%	98.9%
≥ 3 Mbps Down	98.9%	98.5%	92.8%	91.5%
≥ 6 Mbps Down	0%	0%	87.0%	85.3%
≥ 10 Mbps Down	0%	0%	86.9%	85.2%
	Population Count	Household Count	Population Count	Household Count
County Totals (2010 Census)	195,751	87,850	6,392,017	2,844,526

Notes: Data presented in table above is as collected by the State of Arizona for the NTIA and FCC broadband maps and submitted in Spring 2013 for Broadband Provider (BP) coverage declared as of 12/31/12. Population across Census Blocks and in proximity to Road Segments are based on calculations utilizing U.S. Census 2010 data.

See also the complementary **WACOG Arizona Broadband Technical Report** in Appendix B for additional Yuma County broadband maps by each technology type, detailed views of the Yuma/San Luis/Somerton areas, and a table of the 14 broadband providers known to be active in the county including their technology type(s) and speed range(s).



Note: More detailed broadband and infrastructure maps for Yuma County by individual technology type and for the City of Yuma, as well as San Luis and Somerton, may be found in the complimentary WACOG Broadband Technical Report.

La Paz County Overview and Broadband Gap Analysis:

La Paz County encompasses 4,518 square miles and has 30 square miles of water. It is the third smallest of Arizona's counties and has a population of 20,281 (2012 estimate) with the lowest population density with 4.6 persons per square mile compared to the statewide average of 56.3. The U.S. Bureau of Land Management controls 58.3 percent of the land; the State of Arizona, 8.8 percent; other public lands, 19.5 percent; the Colorado River Indian Tribe owns 8.1 percent of the land; and 5.3 percent of the land is owned privately or by corporations.

The towns of Parker and Quartzsite are the main population centers, as well as the main business areas for residents and winter visitors. The county's rugged landscape and the Colorado River attract tens of thousands of visitors annually, making tourism the number one industry with tourism revenues north of \$100 million. Quartzsite is known for its winter season gem and mineral shows with more than 1 million visitors coming to the community each year to take part.

Agriculture adds approximately \$83 million to the county's economy annually. That and government are the county's principal industries. Some 45% of employment is in the government sector versus 15% statewide. Unemployment is running 9.0%, not much higher than the 8.3% statewide as of July 2013.

	<u>Population</u>
La Paz County	20,902
Parker (County Seat)	3,082
Quartzsite	3,773
Unincorporated (Including Bouse, Ehrenberg, Salome/Wenden, and the Colorado Indian Reservation)	14,047

For additional La Paz County information see:

- La Paz County - <http://www.co.la-paz.az.us/>
- La Paz Economic Development Corp. - <http://www.lapazedc.com/>
- Parker Area Chamber of Commerce - <http://www.parkeraz.org/>
- Quartzsite Business Chamber of Commerce - <http://www.quartzsitebusinesschamber.com/>
- Yuma County Wikipedia Entry - http://en.wikipedia.org/wiki/La_Paz_County,_Arizona

La Paz County Broadband Gap Analysis:

- There is limited DSL coverage in La Paz County centering on the Parker, Quartzsite, and Salom areas. Just 67.1% of the population can get DSL at ≥ 768 Kbps downstream and a very slim 26.1% can get ≥ 6 Mbps. The Arizona broadband mapping team has discovered an issue in processing Frontier's DSL coverage and will make corrections in the pending Fall 2013 submittal, likely resulting in reporting of slightly less coverage.
- Cable modem based broadband covers a meager 28.7% of the La Paz County population, with spotty coverage in the Parker area and virtually no coverage elsewhere.
- Fixed wireless (licensed and unlicensed) has no footprint in La Paz County with 0.1% of the population covered at the lowest broadband speed of ≥ 768 Kbps.
- Mobile wireless has by far the broadest footprint, estimated to reach 99.9% of the La Paz County population at speeds ≥ 768 Kbps and but dropping precipitously to 24.4% for speeds ≥ 3 Mbps. Quartzsite is largely covered by a 4G network delivering ≥ 6 Mbps, but the rest of the county is confined to lower speeds for now. Aggressive mobile provider 4G upgrades should shift the situation over time.
- A limited number of Middle Mile points, almost always fiber fed, are available primarily from Wecom, Airband Communications, Level3 Communications, CenturyLink, and Zayo.
- SpeedMatters.org reports 62 speed test results for La Paz County with an average download speed of 2,768 Kbps and upload speed of 338 Kbps versus Arizona-wide averages of 3186 Kbps download and 389 Kbps upload (and national averages of 3874 Kbps download and 877 Kbps upload).

The next round of La Paz County broadband community planning and technical assistance activities will focus on:

- The Town of Parker due to it being so underserved (no DSL, cable or fixed wireless broadband for example) and thus a good target and a prime example of underserved population centers to develop strategy and tactics about.

La Paz County Selected Demographics

Baseline Demographics	La Paz County	State of Arizona
County seat/State capitol	Parker	Phoenix
Land area in square miles	4,499.63	113,594.08
Population, 2012 estimate	20,281	6,553,255
Population, percent change, 4/1/10-7/1/12	-1.0%	2.5%
Persons under 18 years, percent, 2012	17.7%	24.7%
Persons 65 years and over, percent, 2012	34.9%	14.8%
Persons per household, 2007-2011	1.96	2.64
Persons per square mile, 2010	4.6	56.3
High school graduate or higher, percent of persons age 25+, 2007-2011	75.4%	85.2%
Bachelor's degree or higher, percent of persons age 25+, 2007-2011	9.3%	26.4%
Per capita income in the past 12 months (2011 dollars), 2007-2011	\$21,358	\$25,784
Median household income, 2007-2011	\$32,220	\$50,752
Persons below poverty level, percent, 2007-2011	19.4%	16.2%
Homeownership rate, 2007-2011	74.6%	66.6%
Total civilian labor force, 7/13	7,761	3,017,815
Total employment, 7/13	7,060	2,766,640
Total unemployment, 7/13	701	251,175
Unemployment rate, 7/13	9.0%	8.3%

Employment by Category (July 2013 Estimates)	La Paz County by Population	Statewide by Population	La Paz County %	Statewide %
Total Nonfarm	5,125	2,453,900	100.0%	100.0%
Total Private Employment	2,800	2,088,300	54.6%	85.1%
Goods Producing	425	296,200	8.3%	12.1%
Mining and Construction	-	139,400	-	5.7%
Manufacturing	-	156,800	-	6.4%
Service-Providing	4,700	2,157,700	91.7%	87.9%
Private Service-Providing	2,375	1,792,100	46.3%	73.0%
Trade, Transportation & Utilities	1,150	482,600	22.4%	19.7%
Information	-	39,600	-	1.6%
Financial Activities	-	183,200	-	7.5%
Professional & Business Services	-	360,500	-	14.7%
Educational & Health Services	-	369,700	-	15.1%
Leisure and Hospitality	-	272,100	-	11.1%
Other Private Services	1,225	84,400	23.9%	3.4%
Government	2,325	365,600	45.4%	14.9%
Federal Government	300	55,700	5.9%	2.3%
State & Local Government	2,025	309,900	39.5%	12.6%

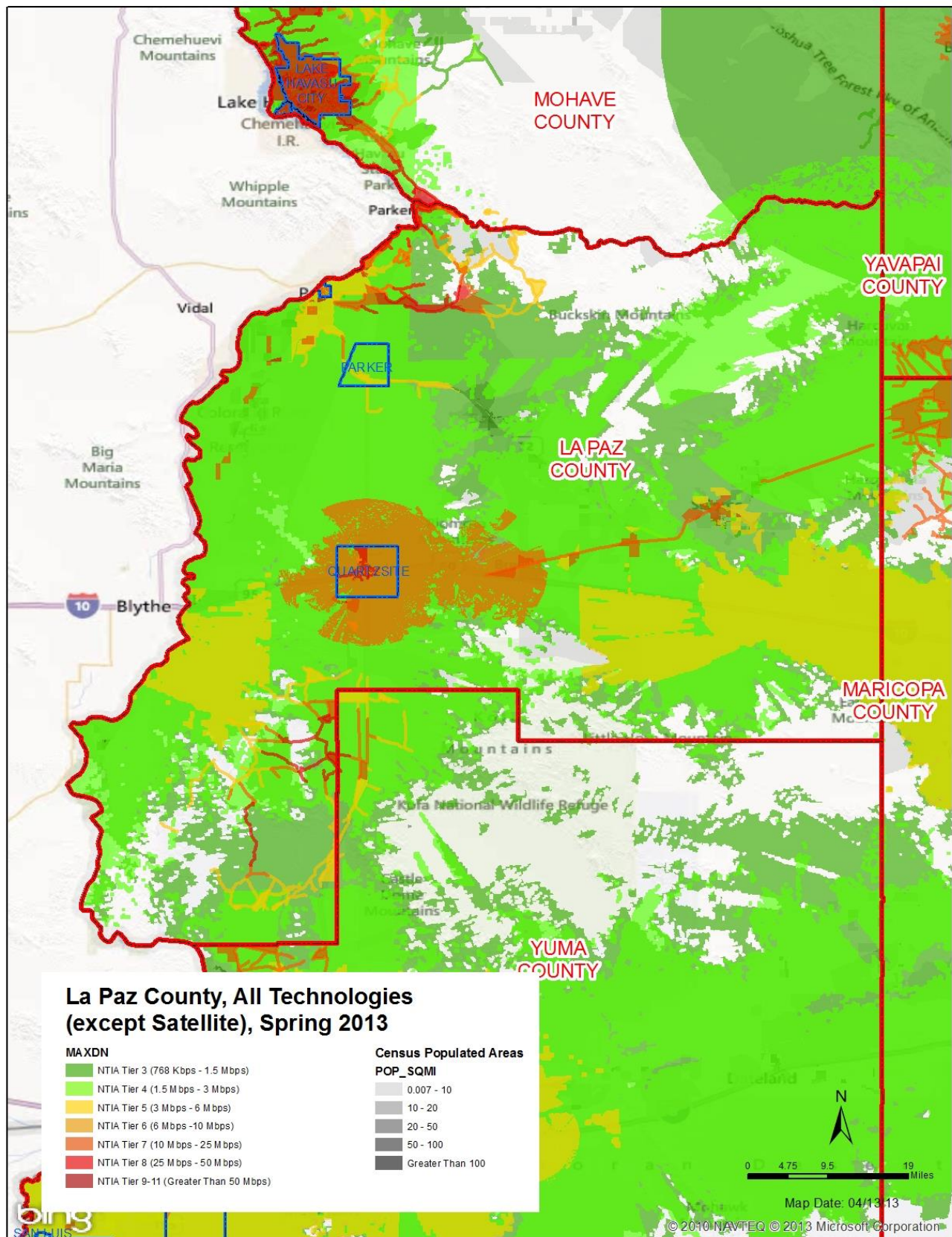
Sources: U.S. Census Bureau State & County QuickFacts (<http://quickfacts.census.gov/>) and ADOA Office of Employment & Population Statistics (<http://www.workforce.az.gov/>). For employment by category estimates, farm employment, private household employment, and self-employment are excluded and all employment statistics are non-seasonally adjusted.

La Paz County Broadband Coverage for Spring 2013

	La Paz County		State of Arizona	
All Broadband Tech (Except Satellite)	Population	Household	Population	Household
≥ 768 Kbps Down	99.9%	99.9%	99.5%	99.5%
≥ 3 Mbps Down	73.9%	76.8%	97.8%	97.5%
≥ 6 Mbps Down	59.1%	67.8%	95.6%	95.2%
≥ 10 Mbps Down	59.0%	67.6%	95.1%	94.6%
DSL, xDSL & Other Copper Tech	Population %	Household %	Population	Household
≥ 768 Kbps Down	67.1%	67.0%	93.1%	92.8%
≥ 3 Mbps Down	63.8%	64.5%	87.2%	86.4%
≥ 6 Mbps Down	26.1%	37.3%	79.9%	78.4%
≥ 10 Mbps Down	26.0%	37.1%	70.1%	68.4%
Cable Modem Technologies	Population	Household	Population	Household
≥ 768 Kbps Down	28.7%	28.1%	89.3%	88.7%
≥ 3 Mbps Down	28.7%	28.1%	89.3%	88.7%
≥ 6 Mbps Down	27.2%	27.2%	89.2%	88.6%
≥ 10 Mbps Down	27.2%	27.2%	89.2%	88.6%
Fixed Wireless Technologies	Population	Household	Population	Household
≥ 768 Kbps Down	0.1%	0.1%	94.7%	94.5%
≥ 3 Mbps Down	0%	0%	62.0%	62.9%
≥ 6 Mbps Down	0%	0%	34.8%	34.9%
≥ 10 Mbps Down	0%	0%	5.4%	5.4%
Mobile Wireless Technologies	Population	Household	Population	Household
≥ 768 Kbps Down	99.9%	99.9%	98.7%	98.9%
≥ 3 Mbps Down	24.4%	29.5%	92.8%	91.5%
≥ 6 Mbps Down	24.1%	29.1%	87.0%	85.3%
≥ 10 Mbps Down	24.1%	29.1%	86.9%	85.2%
	Population Count	Household Count	Population Count	Household Count
County Totals (2010 Census)	20,489	16,049	6,392,017	2,844,526

Notes: Data presented in table above is as collected by the State of Arizona for the NTIA and FCC broadband maps and submitted in Spring 2013 for Broadband Provider (BP) coverage declared as of 12/31/12. Population across Census Blocks and in proximity to Road Segments are based on calculations utilizing U.S. Census 2010 data.

See also the complementary **WACOG Arizona Broadband Technical Report** in Appendix C for additional La Paz County broadband maps by each technology type, detailed views of the Parker and Quartzsite areas, and a table of the 13 broadband providers known to be active in the county including their technology type(s) and speed range(s).



Note: More detailed broadband and infrastructure maps for La Paz County by individual technology type and for the communities of Parker and Quartzsite may be found in the complimentary WACOG Broadband Technical Report.

Mohave County Overview and Broadband Gap Analysis:

Mohave County is geographically the second largest in the state and the fifth largest in the country covering 13,479 square miles. The U.S. Forest Service and Bureau of Land management own 55.2 percent of the land; Indian reservations, 6.7 percent; the state of Arizona, 6.6 percent; individual or corporate, 17.2 percent; and other public lands, 14.3 percent. Most of it is classified as desert.

The county has 186 square miles of water with 1,000 miles of shoreline and is a great water sports center. It also has the longest stretch of historic Route 66. The Colorado River and two man-made lakes, Lake Mohave and Lake Havasu, play an important role in the growth and vitality of Lake Havasu City and Bullhead City.

Mohave County's top industries are arts and entertainment, healthcare services, manufacturing, distribution, transportation, logistics and energy. Part of Mohave County and all of Colorado City are designated Enterprise Zones. Some 17% of employment is in the government sector versus 15% statewide. Unemployment is running 9.7%, not much higher than the 8.3% statewide as of July 2013.

The Mohave region's Distribution, Logistics and Transportation Industry Cluster is currently in a strategic position for growth as Pacific ports and other west coast inland ports continue to reach capacity and the planned I-11 highway becomes a critical passageway of the CANAMEX Corridor. Mohave County's vast desert areas offer some of the highest solar and wind power potential in the nation.

	<u>Population</u>
Mohave County	203,072
Kingman (County Seat)	28,335
Lake Havasu City	52,720
Bullhead City	39,516
Colorado City	4,818
Unincorporated (Including New Kingman/Butler)	77,683

For additional Mohave County information see:

- Mohave County - <http://www.mohavecounty.us/>
- Mohave County Economic Development. - <http://www.mohavedevelopment.org/>
- Bullhead City Chamber of Commerce - <http://www.bullheadchamber.com/>
- Kingman Chamber of Commerce - <http://www.kingmanchamber.org/>
- Lake Havasu Area Chamber of Commerce - <http://www.havasuchamber.com/>
- Mohave County Wikipedia Entry - http://en.wikipedia.org/wiki/Mohave_County,_Arizona

Mohave County Broadband Gap Analysis:

- There is significant DSL coverage in Mohave County especially in the Bullhead City, Kingman, and Lake Havasu City areas with just a little coverage in the Colorado City and Mesquite areas. Some 89.2% of the population can get DSL at ≥ 768 Kbps downstream and 73.1% can get ≥ 6 Mbps. The Arizona broadband mapping team has discovered an issue in processing Frontier's DSL coverage and will make corrections in the pending Fall 2013 submittal, likely resulting in reporting of slightly less coverage.
- Cable modem based broadband covers 77.7% of the Mohave County population, again centering on the Bullhead City, Kingman, and Lake Havasu City areas with speeds ≥ 3 Mbps and 75.8% with speeds ≥ 10 Mbps. There is no apparent cable coverage in the Colorado City and Mesquite areas.
- Fixed wireless (licensed and unlicensed) has an extensive footprint estimated to reach 91.6% of the Mohave County population primarily in the Bullhead City, Kingman, and Lake Havasu City areas with just a little coverage in the Mesquite area and none in Colorado City. Fixed wireless coverage at ≥ 3 Mbps is available to only 64.1% of the population and at ≥ 6 Mbps is available to only 31.6% of the population.
- Mobile wireless has by far the broadest footprint, estimated to reach 96.2% of the Mohave County population at speeds ≥ 768 Kbps but only 48.4% for speeds ≥ 3 Mbps and 0% with speeds ≥ 6 Mbps.
- A limited number of Middle Mile points, almost always fiber fed, are available primarily from Wecom, Airband Communications, Level3 Communications, and CenturyLink.
- SpeedMatters.org reports 97 speed test results for Mohave County with an average download speed of 2,506 Kbps and upload speed of 503 Kbps versus Arizona-wide averages of 3186 Kbps download and 389 Kbps upload (and national averages of 3874 Kbps download and 877 Kbps upload).

The next round of Mohave County broadband community planning and technical assistance activities will focus on:

- The Kingman Airport Industrial Park & I-40 Industrial Corridor also reflecting potentials broadband needs and opportunities relative to the pending I-11 highway infrastructure.

Mohave County Selected Demographics

Baseline Demographics	Mohave County	State of Arizona
County seat/State capitol	Kingman	Phoenix
Land area in square miles	13,311.08	113,594.08
Population, 2012 estimate	203,334	6,553,255
Population, percent change, 4/1/10-7/1/12	1.6%	2.5%
Persons under 18 years, percent, 2012	19.8%	24.7%
Persons 65 years and over, percent, 2012	24.9%	14.8%
Persons per household, 2007-2011	2.45	2.64
Persons per square mile, 2010	15.0	56.3
High school graduate or higher, percent of persons age 25+, 2007-2011	83.9%	85.2%
Bachelor's degree or higher, percent of persons age 25+, 2007-2011	12.2%	26.4%
Per capita income in the past 12 months (2011 dollars), 2007-2011	\$21,457	\$25,784
Median household income, 2007-2011	\$40,573	\$50,752
Persons below poverty level, percent, 2007-2011	16.8%	16.2%
Homeownership rate, 2007-2011	71.2%	66.6%
Total civilian labor force, 7/13	83,641	3,017,815
Total employment, 7/13	75,565	2,766,640
Total unemployment, 7/13	8,076	251,175
Unemployment rate, 7/13	9.7%	8.3%

Employment by Category (July 2013 Estimates)	Mohave County by Population	Statewide by Population	Mohave County %	Statewide %
Total Nonfarm	44,000	2,453,900	100.0%	100.0%
Total Private Employment	36,700	2,088,300	83.4%	85.1%
Goods Producing	4,800	296,200	10.9%	12.1%
Mining and Construction	2,000	139,400	4.5%	5.7%
Manufacturing	2,800	156,800	6.4%	6.4%
Service-Providing	39,200	2,157,700	89.1%	87.9%
Private Service-Providing	31,900	1,792,100	72.5%	73.0%
Trade, Transportation & Utilities	10,400	482,600	23.6%	19.7%
Information	600	39,600	1.4%	1.6%
Financial Activities	1,800	183,200	4.1%	7.5%
Professional & Business Services	3,600	360,500	8.2%	14.7%
Educational & Health Services	8,300	369,700	18.9%	15.1%
Leisure and Hospitality	5,500	272,100	12.5%	11.1%
Other Private Services	1,700	84,400	3.9%	3.4%
Government	7,300	365,600	16.6%	14.9%
Federal Government	500	55,700	1.1%	2.3%
State & Local Government	6,800	309,900	15.5%	12.6%

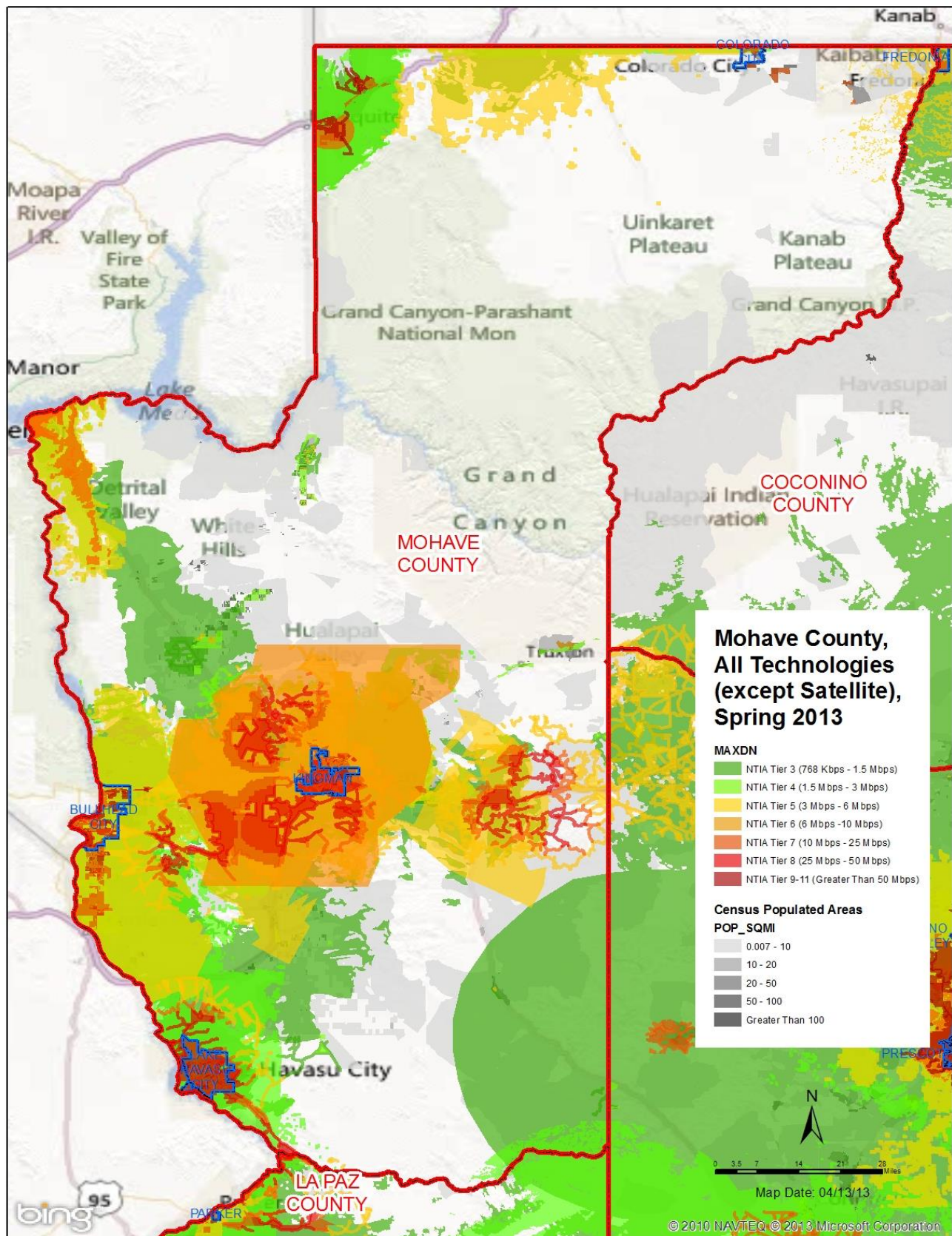
Sources: U.S. Census Bureau State & County QuickFacts (<http://quickfacts.census.gov/>) and ADOA Office of Employment & Population Statistics (<http://www.workforce.az.gov/>). For employment by category estimates, farm employment, private household employment, and self-employment are excluded and all employment statistics are non-seasonally adjusted.

Mohave County Broadband Coverage for Spring 2013

	Mohave County		State of Arizona	
All Broadband Tech (Except Satellite)	Population	Household	Population	Household
≥ 768 Kbps Down	99.4%	99.0%	99.5%	99.5%
≥ 3 Mbps Down	97.3%	96.1%	97.8%	97.5%
≥ 6 Mbps Down	92.3%	89.5%	95.6%	95.2%
≥ 10 Mbps Down	86.8%	84.3%	95.1%	94.6%
DSL, xDSL & Other Copper Tech	Population %	Household %	Population	Household
≥ 768 Kbps Down	89.2%	87.8%	93.1%	92.8%
≥ 3 Mbps Down	83.3%	80.6%	87.2%	86.4%
≥ 6 Mbps Down	73.1%	70.1%	79.9%	78.4%
≥ 10 Mbps Down	54.5%	52.0%	70.1%	68.4%
Cable Modem Technologies	Population	Household	Population	Household
≥ 768 Kbps Down	77.7%	77.4%	89.3%	88.7%
≥ 3 Mbps Down	77.7%	77.4%	89.3%	88.7%
≥ 6 Mbps Down	75.8%	75.8%	89.2%	88.6%
≥ 10 Mbps Down	75.8%	75.8%	89.2%	88.6%
Fixed Wireless Technologies	Population	Household	Population	Household
≥ 768 Kbps Down	91.6%	92.4%	94.7%	94.5%
≥ 3 Mbps Down	64.1%	61.5%	62.0%	62.9%
≥ 6 Mbps Down	31.6%	26.8%	34.8%	34.9%
≥ 10 Mbps Down	0.6%	0.5%	5.4%	5.4%
Mobile Wireless Technologies	Population	Household	Population	Household
≥ 768 Kbps Down	96.2%	96.2%	98.7%	98.9%
≥ 3 Mbps Down	48.4%	45.8%	92.8%	91.5%
≥ 6 Mbps Down	0%	0%	87.0%	85.3%
≥ 10 Mbps Down	0%	0%	86.9%	85.2%
	Population Count	Household Count	Population Count	Household Count
County Totals (2010 Census)	200,186	110,911	6,392,017	2,844,526

Notes: Data presented in table above is as collected by the State of Arizona for the NTIA and FCC broadband maps and submitted in Spring 2013 for Broadband Provider (BP) coverage declared as of 12/31/12. Population across Census Blocks and in proximity to Road Segments are based on calculations utilizing U.S. Census 2010 data.

See also the complementary **WACOG Arizona Broadband Technical Report** in Appendix B for additional Mohave County broadband maps by each technology type, detailed views of the Bullhead City, Kingman, and Lake Havasu areas, and a table of the 24 broadband providers known to be active in the county including their technology type(s) and speed range(s).



Note: More detailed broadband and infrastructure maps for Mohave County by individual technology type and for the communities of Kingman, Bullhead City, and Lake Havasu City may be found in the complimentary WACOG Broadband Technical Report.

WACOG Regional Broadband Project Profiles:

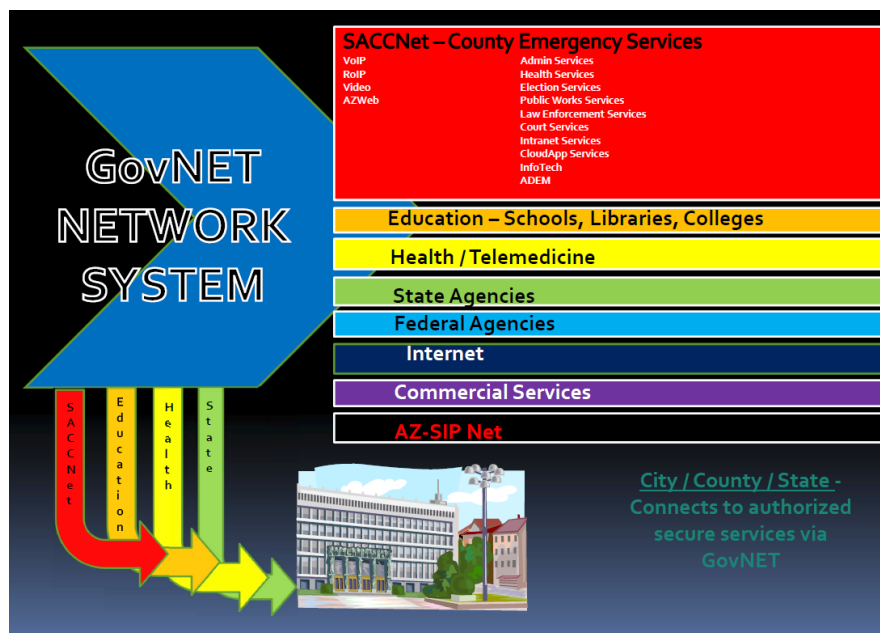
GovNET LLC/SACCCNet BTOP Grant and Planned Network:

GovNET, LLC is a specialized telecommunications provider committed to data integrity, secure high capacity transmissions, and customized network connections at affordable rates. GovNET (<http://www.govnet.net/>) received a \$39.3M Broadband Technology Opportunities Program (BTOP) grant to construct a state-of-the-art multi-purpose interoperable broadband network covering entire State and partners on this project with Telink Networks SW, focusing on the specific needs of local, state, and federal agency communications seeking security and reliability. GovNET build and operations have restarted after an NTIA audit and temporary suspension with a timeline extension to complete the network build and activation.

GovNET will operate as a common carrier providing 8 base pipes with a statewide microwave broadband network to support community anchor institutions and last-mile broadband service providers, addressing critical middle mile infrastructure needs in Arizona's rural counties. The network will offer speeds of between 100-300 Mbps to key anchor institutions, a significant upgrade from the T1 service many key institutions currently have. The resulting statewide broadband network should significantly improve public safety, healthcare delivery, and other critical government services for the people, institutions, and enterprises of Arizona.

SACCCNet is an Application Network utilizing 2 of the 8 base pipes and planning to:

- Construct 316 new microwave towers to expand services across a total of more than 8,400 miles in each of the state's 15 counties.
- Facilitate more affordable and accessible broadband service for an estimated 481,000 households and over 25,000 businesses by enabling local Internet service providers to utilize the project's open network.
- Enable broadband connectivity to as many as 280 anchor institutions, including 15 public safety entities, 82 K-12 public schools, 115 libraries, 14 community colleges, three additional institutions of higher education, 26 healthcare providers, and 26 state and local government facilities.



See the NTIA page at <http://www2.ntia.doc.gov/grantee/govnet-llc> for grant information and the **Southeast Arizona Broadband Technical Report Appendix F: Transportation and Other Public Infrastructure** for GovNET network topology and map views.

Mohave Community College WAN:

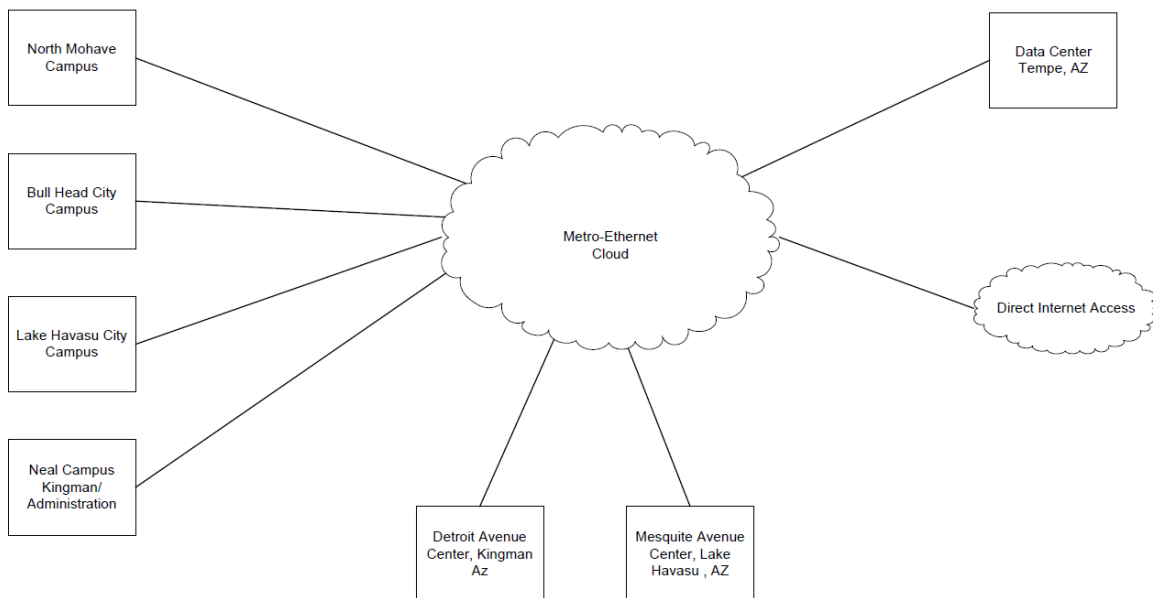
Mohave Community College (MCC) operates four campuses and two additional educational and teaching centers in Mohave County in northwestern Arizona. MCC is a multi-dimensional operation conducting education, training, and public service programs. A key element of the mission of the College's Information Technology Department's (IT) Technology Infrastructure is to provide high quality, reliable, and cost efficient telecommunications systems and services that support the diverse College community in support of these programs.

MCC telecommunication networks support learning environments on the six physical campuses/teaching centers, an extended campus supporting distance education and community, high speed internet connectivity, and high speed connectivity to data systems reside at a data center in Tempe, AZ. While the College operates a very robust, high capacity county wide IP backbone network (100 Mbps full duplex metro-Ethernet links to a cloud), significant challenges exist to provision that capacity to each and every College site, especially the North Mohave Campus located in Colorado City on the Utah border where MCC has heretofore encountered difficulties in having stable/consistent connectivity.

MCC released an RFI last December for the implementation of a Wide Area Network (WAN) connecting its six higher educational facilities for the delivery of system-wide telephony and related network/application services and is considering the vendors' responses. The proposed WAN will likely require substantial changes in the way that telephony and related application services are provisioned, delivered, and supported, as well as impact the design and provisioning of system-wide IP services and may require a phased adoption over a multi-year period in order to fully develop the infrastructure necessary to ensure the delivery of quality services to the MCC community.

The conceptual diagram below illustrates the simplicity of a local or metro Ethernet cloud connected to Tier 1 Internet access and a primary data center facility. But good broadband connections to each facility remains necessary for robust interconnectivity and the establishment of MCC's next generation communication service platform. This is an excellent example of a wide-flung rural enterprise seeking to evolve to a modern broadband infrastructure and IP based services.

Mohave Community College WAN Conceptual Diagram



Healthy La Paz:

La Paz County Health Department (LPCHD) has launched the Health LA PAZ project (<http://www.lpchd.com/healthy-la-paz.html>), a community coalition that focuses on improved health in La Paz County. Using the Mobilizing for Action through Planning and Partnerships (MAPP) model, LPCHD invited a broad coalition of key community leaders in multiple sectors to participate in strategic planning to improve the public's health. This process led to the creation of a Community Health Improvement Plan (CHIP) which will serve as a foundation for the upcoming action cycle.

The data and outcomes from a series of MAPP Assessments with the LPCHD Core Support Group and the citizen Steering Committee helped the Healthy LA PAZ Steering Committee to preliminarily identify six strategic issues for the community:

- Internal and external communication and coordination challenges with partners within La Paz County's local public health system
- Low access to care for county residents
- Lack of infrastructure/need for infrastructure development (particularly communications and public transportation)
- Lack of economic development and jobs
- Chronic Disease Management
- Safe neighborhoods (domestic violence, child abuse, substance abuse, bullying, crime)

And of those six strategic issues, one of the three most pressing strategic issues was determined to be the lack of infrastructure/need for infrastructure development (particularly communications and public transportation). In that regard, Health LA PAZ now has specific goals and strategies to partner with the Focused Futures coalition to focus on communications and transportation, fully participate in the Broadband Task Force convened by the Western Arizona Council of Governments (WACOG), and assess how La Paz County can improve its transit systems going forward.



Arizona Job Assistance Centers (AzJAC):

A library outranks any other one thing a community can do to benefit its people. It is a never failing spring in the desert.

Andrew Carnegie

Public computer centers at libraries in Arizona are overwhelmed with patrons and job seekers who wish to utilize internet access to search for jobs and obtain or improve job related skills training. To address this demand, Arizona Governor's Office of Economic Recovery, in partnership with Arizona State Library, Archives and Public Records, a division of the Secretary of State, developed the Arizona Job Assistance Center (AzJAC - <http://jobhelp.azlibrary.gov/>) with a \$1.6M grant from NTIA BTOP and matching funds of \$706K from the Bill & Melinda Gates Foundation and others.

The AzJAC Project was developed to create public locations throughout the state to assist those seeking employment by means of furthering education and career training. In conjunction with key partners from the Arizona Workforce Connection, the Arizona Department of Education, and the Arizona Small Business Development Center, this project seeks to address the overwhelming need for access to computers for the purposes of searching for and applying for jobs; and to obtain and improve job related skills. Workstations dedicated for job-seekers have been placed in almost 200 libraries statewide. Staff hired in 30 libraries have added new job assistance services including one-on-one counseling, classes and workshops, job clubs library staff training, and collaboration with community organizations and social services.

Specific job help locations for each of WACOG's counties can be found at:

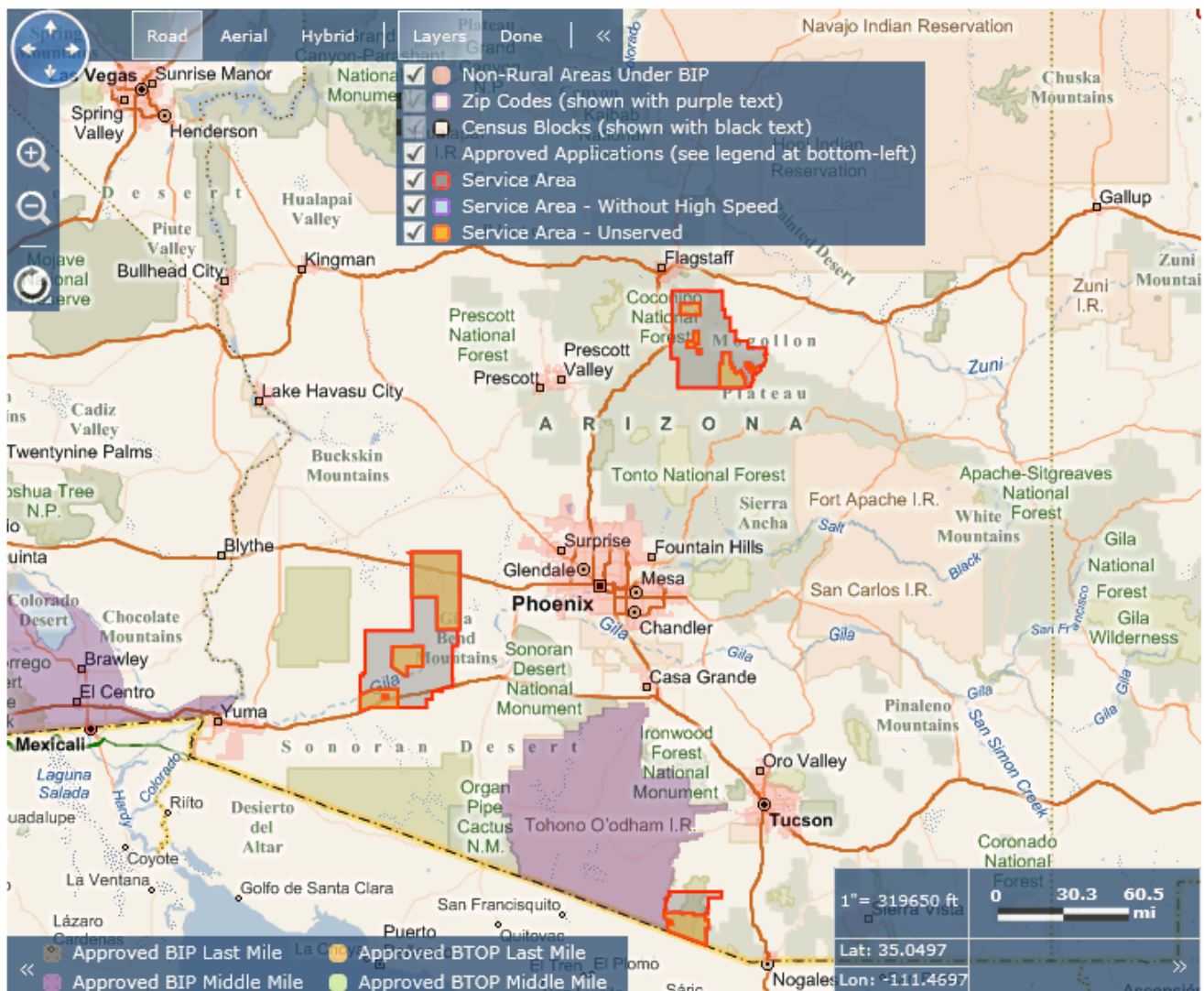
- Yuma County - <http://jobhelp.azlibrary.gov/yuma.html>
- La Paz County - <http://jobhelp.azlibrary.gov/lapaz.html>
- Mohave County - <http://jobhelp.azlibrary.gov/mohave.html>



TDS Telecom USDA RUS-Funded Broadband Expansion in Arizona:

Arizona Telephone Company d/b/a TDS Telecommunications Corp. (TDS) has announced that construction is underway on its United States Department of Agriculture's (USDA) Rural Utilities Service (RUS) grants funded under the American Recovery and Reinvestment Act (ARRA). The parts of Arizona included are near the Gila Bend Mountains, near the Coconino National Forest, and near the state's southern-most border. A portion of the planned broadband infrastructure expansion extends into the western part of Yuma County. Once complete, about 600 customers in the areas will gain access to TDS' high-speed Internet services.

TDS has hired TelCom Construction with a branch location in Phoenix to do the outside construction work on this project, while TDS will complete the inside work. The project is scheduled to provide ADSL2+ service to customers by the fall of 2014. Arizona is one of 44 of TDS Telecom's broadband stimulus projects that are leveraging USDA RUS funding.



For more information, see the TDS Telecom press release of 6/10/13 at <http://www.fiercetelecom.com/press-releases/tds-breaks-ground-arra-stimulus-project-parts-arizona>.

WACOG Broadband Community Planning Next Round:

ASET is providing additional grant funding to continue to support WACOG Broadband Community Planning and Technical Assistance activities in the second half of 2013. In the Broadband Community Planning area, International Research Center (<http://www.researchedge.com/>) has been engaged for next round activities as follows:

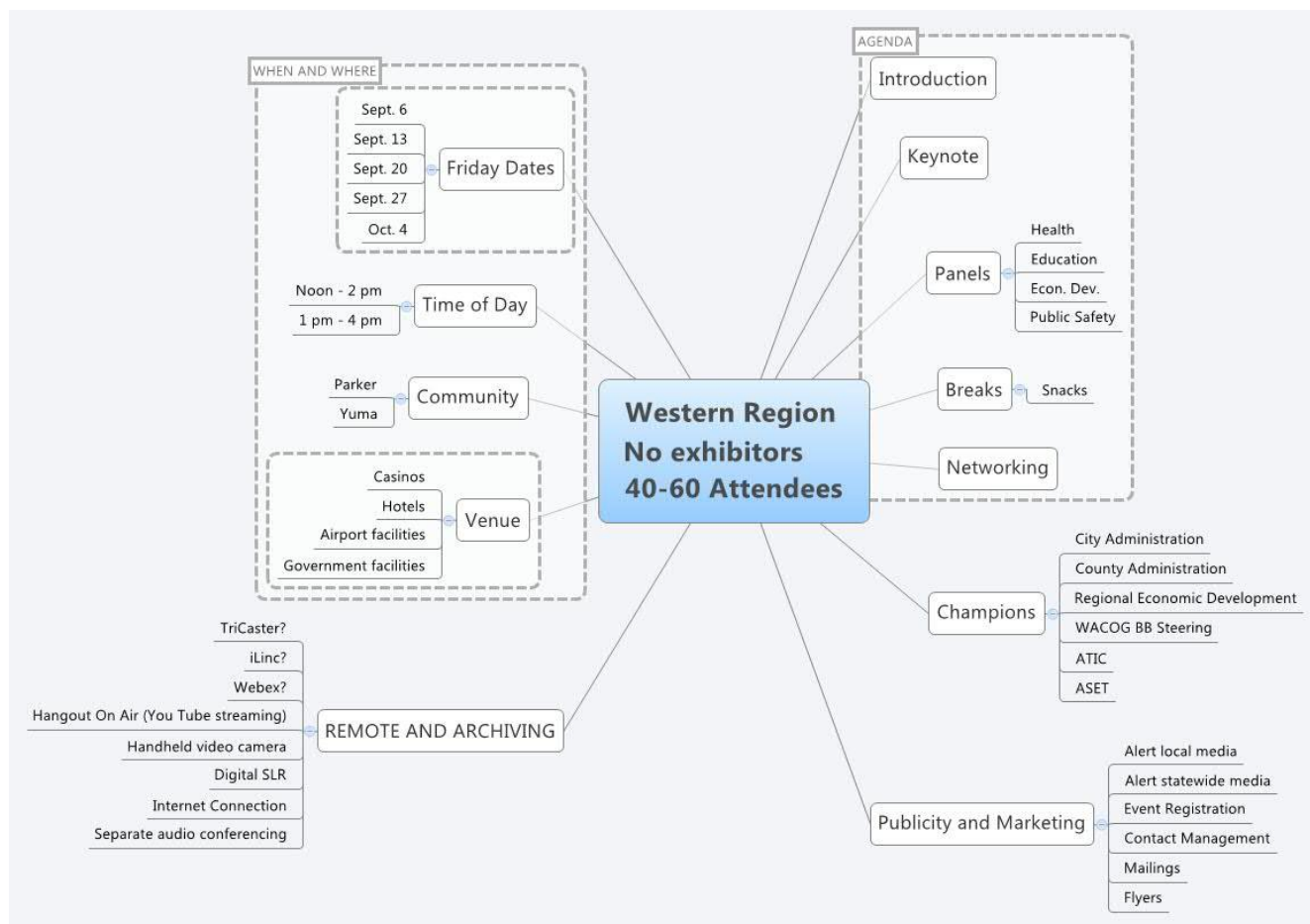
- Continued development of business case(s) and specific strategies and tactics, including: broadband enabled retention and expansion of Jobs/Employment; improvements in Education including, electronic curricula, assessment and distance learning; improvements in Tele-Health applications and processes between and among the patient, clinic, hospital and physician; and general enhancement of quality of life. These applications are aligned with the Digital Arizona Program (DAP) and a complete system proposal will be prepared for digital capacity expansion in the WACA, three county region.
- Identification of grant writing opportunities and support in WACA's efforts to apply for funding of broadband infrastructure buildouts.
- Continuation and growth of regional sub-committees within the three county region.
- Updates and added resources on broadband-related web pages on the WACA website (and on county sites where appropriate) to communicate progress and foster community interest in the activities listed above.

In the next round, outreach to assess and improve broadband availability and adoption planning and capacity building will focus on the following four WACOG regions:

- Region 1 - City of San Luis & Port of Entry (Yuma County) as the "hot zone" for WACOG border activity and hub for international transportation and logistics.
- Region 2 - Yuma Area Aviation (Yuma International Airport, Marine Corps Air Station, U.S. Army Yuma Proving Ground, Southwest Arizona UAS Test Range Overlay) where there is a significant military and aerospace & defense industry presence with a pending national UAS test center anticipated to drive additional activity and growth.
- Region 3 - Town of Parker (County seat of La Paz County) due to it being so underserved (no DSL, cable or fixed wireless broadband for example) and thus a good target and a prime example of underserved population centers to develop strategy and tactics about.
- Region 4 - Kingman Airport Industrial Park & I-40 Industrial Corridor (Mohave County) also reflecting potentials broadband needs and opportunities relative to the pending I-11 highway infrastructure.

Also in the next round, the WACOG Broadband Steering Committee has the opportunity to partner with the Arizona Telecommunications and Information Council (ATIC - <http://arizonatele.com/>) on the planning and production of a WACOG Rural Broadband Conference. ATIC has some funding from ASET through the NTIA broadband planning grant and has produced the first of four anticipated half-day Rural Broadband Conferences in Pinetop-Lakeside on July 19, 2013. A mind map illustration of the potential conference planning concerns and relationships follows.

ATIC and WACOG Rural Broadband Conference Planning



Appendix A: WACOG Broadband Steering Committee

The WACOG Broadband Subcommittee was organized during November and December of 2012. The committee has held two official meetings, one in person and one by conference call. There have also been a number of email communications. This subcommittee is organized under the Economic Development Committee of WACOG.

The input received from the above stakeholders provided the key objectives for each of the three regions. It was determined that the Key Objectives would be as follows: The Subcommittee will continue to determine the focus for how to develop better internet solutions each of the four applications. It is essential to develop and support ongoing conversations between local leaders in education, healthcare, public safety, business, and economic development in each of the target communities. Only these leaders can develop a plan for aggregating their collective demand for Better Broadband and assist in making an effective case for investment by their communities and the private sector. These local leaders can provide a direct interface to anchor institutions and operators. They can contribute significantly to structuring cooperative planning and financing partnerships among the service providers and their communities, relative to broadband infrastructure.

Interviews have been conducted with key stakeholders. Flaws and limitations have been recognized relative to the current broadband availability. Key areas of concern have been identified from the stakeholders. Objectives have been determined and listed below that respond to these interviews and feedback regarding the need for improved broadband in the three regions of WACOG. Key stakeholders and their motivation for better broadband are listed below:

WACOG Broadband Steering Committee:

Western Arizona Council of Governments (WACOG):

- Brian Babiars, Executive Director, Western Arizona Council of Governments (WACOG - <http://www.wacog.com/>)
- Andrew C. Phelan III, Finance Director, Western Arizona Council of Governments (WACOG - <http://www.wacog.com/>)

Committee Support Resources:

- Mark Goldstein, President & IRC Consulting Team Leader, International Research Center (IRC - <http://www.researchedge.com/>)
- Brad Zerbe, ASET/ATII Project Consultant, B2G Solutions (<http://b2g-solutions.com/>)

Economic Development Stakeholders:

- Julie Engel, President/CEO, Greater Yuma Economic Development Corporation (GYEDC - <http://www.greateryuma.org/>)
- Greg LaVann, Sr. Project Manager, Greater Yuma Economic Development Corporation (GYEDC - <http://www.greateryuma.org/>)
- Alison Morey, Project Manager Great Yuma Development Corporation (GYEDC - <http://www.greateryuma.org/>)
- Vincent (Skip) Becker, President / CEO, La Paz Economic Development Corporation (<http://www.lapazedc.com/>)

- D.L. Wilson, Supervisor, La Paz County (<http://www.co.la-paz.az.us/>) & APS
- Bennett Bratley, Acting Director & Economic Development Specialist, Mohave County Economic Development Department (EDD - <http://www.mohavedevelopment.org/>)
- Alan Pruitt, Economic Development Director, Western Arizona Economic Development District (WAEDD - <http://www.waedd.org/>)
- Mike Ivers, President/CEO, Yuma Community Food Bank (<http://www.yumafoodbank.org/>)

Educational Technology and Libraries Stakeholders:

- Tom Tyree, County School Superintendent, Yuma County School Superintendent's Office (<http://www.co.yuma.az.us/index.aspx?page=326>), Yuma County Schools - <http://www.co.yuma.az.us/index.aspx?page=333>
- Dean Farar, Director of Technology, Yuma Educational Technology Consortium (YETC) (<http://www.yumaed.org/>)
- Janice Shelton, County School Superintendent, La Paz County Education Service Agency (<http://www.lapazschools.org/>)
- Pat Koury, Superintendent, Hyder School District, Governing body of Dateland Elementary School (<http://www.hyderschools.org/>)
- Michael D. File, Mohave County School Superintendent, (<http://www.mohavecounty.us/ContentPage.aspx?id=130>), Mohave County Educational Service Center (MCESC - <http://www.mcsc.k12.az.us/>)
- Andy Kong, IT Director, Carpe Diem Collegiate HS & MS (<http://carpediemschools.com/>), Desert View Academy
- Brenda Warnock, Interim Director of Technology Support Services, Arizona Western College (La Paz & Yuma Counties, <http://www.azwestern.edu/>), Technology & Network Services Department (TANS) (http://www.azwestern.edu/information_technology/tss.html)
- Chad Coleman, Interim Director of Computer Information Systems, Arizona Western College (La Paz & Yuma Counties, <http://www.azwestern.edu/>)
- Ted McKeever, Chief Information Officer (CIO), Information Technology, Mohave Community College (MCC - <http://www.mohave.edu/>)
- Ruthie Davis, Library Manager, Parker Public Library (<http://www.parkerpubliclibraryaz.org/>)

Transportation Stakeholders:

- Sharon Mitchell, Transportation Planner, Western Arizona Council of Governments (WACOG - <http://www.wacog.com/>, http://www.wacog.com/transportation_services.html)
- Charles Gutierrez, Associate Transportation Planner II/Traffic Data Management Supervisor, Yuma Metropolitan Planning Organization (YMPO - <http://ympo.org/>)
- Mark Hoffman, ADOT Project Manager & YMPO Technical Advisory Committee (TAC), Arizona Department of Transportation (ADOT - <http://www.azdot.gov/>)
- Craig Williams, Airport Director, Yuma County Airport Authority (<http://www.yumaairport.com/>)

- Gen Grosse, Corporate Account Manager, Yuma County Airport Authority (<http://www.yumaairport.com/>)
- Jason Frost, Chief Technology Officer (CTO), Yuma County Airport Authority (<http://www.yumaairport.com/>)

Government IT Stakeholders:

- Ed Jin, Chief Information Officer (CIO), Information Technology Services Department, Yuma County (<http://www.co.yuma.az.us/index.aspx?page=398>)
- John Settles, Acting Department Head, Information Technology, La Paz County (<http://co.la-paz.az.us/>)
- Nathan McDaniel, Director, Information Technology Department, Mohave County (<http://www.mohavecounty.us/ContentPage.aspx?id=121>)

Healthcare Stakeholders:

- Shaunna Ruis, Director of Business Services, Sunset Community Health Center (<http://www.sunset-chc.org>)
- Vickie Clark, CEO, La Paz Regional Hospital (<http://lapazhospital.org/>)
- Melanie Sarino, MPH, Epidemiologist/Healthy La Paz Project Manager, La Paz County Health Department, Public Health Emergency Response & Preparedness Division (<https://www.facebook.com/LaPazCounty.HealthDepartment>)
- Katie Turnbow, Assistant Emergency Preparedness Coordinator, Public Information Officer, Exercise Coordinator, La Paz County Health Department, Public Health Emergency Response & Preparedness Division (<https://www.facebook.com/LaPazCounty.HealthDepartment>)
- Bob Sarnecki, Chief Information Officer (CIO), Kingman Regional Medical Center (KRMCC - <http://www.azkrmc.com/>)

Public Safety Stakeholders:

- Chris Chambers, Chief, Buckskin (Parker) Fire Department (<http://www.buckskinfiredepartment.com/>)
- Leon Wilmot, Yuma County Sheriff, Yuma County Sheriff's Office (<http://yumacountysheriff.org/>)
- John C. Drum, La Paz County Sheriff, La Paz County Sheriff's Office (<http://www.lapazsheriff.org/>)
- Tom Sheahan, Mohave County Sheriff, Mohave County Sheriff's Office (<http://www.mohavecounty.us/ContentPage.aspx?id=131>)

Appendix B: Arizona Broadband Statistics (for Spring 2013)

	Statewide		Rural		Sparsely Pop. Rural	
All Broadband Tech (Except Satellite) 1 or More Providers	Population	Household	Population	Household	Population	Household
≥ 768 Kbps Down	99.5%	99.5%	97.5%	97.6%	95.2%	95.7%
≥ 3 Mbps Down	97.8%	97.5%	88.8%	88.3%	81.6%	81.0%
≥ 6 Mbps Down	95.6%	95.2%	78.3%	77.8%	67.3%	65.9%
≥ 10 Mbps Down	95.1%	94.6%	75.8%	75.0%	63.3%	61.6%
All Broadband Tech (Except Satellite) 2 or More Providers	Population	Household	Population	Household	Population	Household
≥ 768 Kbps Down	98.5%	98.6%	92.7%	93.2%	87.8%	88.7%
≥ 3 Mbps Down	95.6%	95.2%	78.0%	77.3%	67.7%	65.8%
≥ 6 Mbps Down	91.1%	90.1%	60.7%	59.5%	49.8%	47.1%
≥ 10 Mbps Down	89.0%	87.8%	51.8%	50.5%	43.1%	41.1%
All Broadband Tech (Except Satellite) 3 or More Providers	Population	Household	Population	Household	Population	Household
≥ 768 Kbps Down	97.6%	97.3%	87.7%	87.4%	79.9%	79.2%
≥ 3 Mbps Down	92.3%	91.1%	65.4%	63.7%	55.2%	52.3%
≥ 6 Mbps Down	85.4%	83.6%	44.1%	41.6%	35.4%	32.5%
≥ 10 Mbps Down	81.5%	79.5%	31.2%	29.6%	23.0%	22.3%
DSL, xDSL & Other Copper Tech	Population	Household	Population	Household	Population	Household
≥ 768 Kbps Down	93.1%	92.8%	73.4%	73.9%	62.5%	64.1%
≥ 3 Mbps Down	87.2%	86.4%	54.9%	55.2%	41.9%	43.0%
≥ 6 Mbps Down	79.9%	78.4%	41.3%	41.0%	30.2%	30.8%
≥ 10 Mbps Down	70.1%	68.4%	31.1%	31.0%	23.8%	24.1%
Cable Modem Technologies	Population	Household	Population	Household	Population	Household
≥ 768 Kbps Down	89.3%	88.7%	55.5%	55.9%	31.9%	34.3%
≥ 3 Mbps Down	89.3%	88.7%	55.5%	55.9%	31.9%	34.3%
≥ 6 Mbps Down	89.2%	88.6%	55.1%	55.5%	31.5%	33.8%
≥ 10 Mbps Down	89.2%	88.6%	55.1%	55.5%	31.5%	33.8%
Fixed Wireless Technologies	Population	Household	Population	Household	Population	Household
≥ 768 Kbps Down	94.7%	94.5%	76.1%	76.1%	68.3%	68.6%
≥ 3 Mbps Down	62.0%	62.9%	63.1%	62.1%	53.2%	51.5%
≥ 6 Mbps Down	34.8%	34.9%	24.8%	22.8%	20.1%	17.7%
≥ 10 Mbps Down	5.4%	5.4%	10.4%	8.4%	8.1%	6.6%
Mobile Wireless Technologies	Population	Household	Population	Household	Population	Household
≥ 768 Kbps Down	98.7%	98.9%	93.7%	94.6%	90.2%	91.5%
≥ 3 Mbps Down	92.8%	91.5%	68.0%	65.4%	61.0%	57.2%
≥ 6 Mbps Down	87.0%	85.3%	49.5%	47.0%	47.6%	54.3%
≥ 10 Mbps Down	86.9%	85.2%	49.2%	46.8%	47.1%	43.1%
	Population Count	Household Count	Population Count	Household Count	Population Count	Household Count
Arizona Totals (2010 Census)	6,392,017	2,844,526	1,274,234	601,889	651,358	329,022

Arizona Broadband Coverage Table Notes

See a textual description and analysis of this data in the section below, **Arizona Statewide Digital Landscape and Situational Analysis**.

Data presented in the table above is as collected by the State of Arizona for the NTIA and FCC broadband maps and submitted in Spring 2013 for Broadband Provider (BP) coverage declared as of 12/31/12. Population across Census Blocks and in proximity to Road Segments are based on calculations utilizing U.S. Census 2010 data.

The Census Bureau identifies two types of urban areas: **Urbanized Areas (UAs)** of 50,000 or more people and **Urban Clusters (UCs)** of at least 2,500 and less than 50,000 people. Per the Census Bureau, **“Rural”** encompasses all population, housing, and territory not included within Urbanized Areas (UAs). For Arizona analysis purposes, **“Sparsely Populated Rural”** encompasses all population, housing, and territory not included within either Urbanized Areas (UA) or Urban Clusters (UC). Using an Urban Area/Cluster GIS Layer, Arizona is calculated to have a total of 241,666 Census Blocks per the 2010 Census of which:

- 86,648 Census Blocks are in Urban Areas (UAs)
- 19,479 Census Blocks are in Urban Clusters (UCs)
- 106,127 Census Blocks total are in Urban Areas (UAs) or Urban Clusters (UCs)
- 155,018 Census Blocks are in Rural areas (Outside UAs only) with a population count of 1,274,234 and household count of 601,889
- 135,539 Census Blocks are in Sparsely Populated Rural areas (Outside both UAs and UCs) with a population count of 651,358 and household count of 329,022

For wireline providers, census blocks greater than 2 square miles intersected by covered road segments were added to their reported list of census blocks less than or equal to 2 sq. mi. For fixed and mobile wireless providers, census block counts were based on census blocks that intersected (were touched by) an overlaying wireless provider's service area. Satellite providers which tend to offer lower downstream and upstream data rates are not included in the Broadband Providers (BPs) for purposes of this analysis. All census blocks, regardless of area or water characteristic were included in this analysis.

Arizona Statewide Digital Landscape and Situational Analysis

From the Arizona Broadband Assessment Project (AZ BAP) data for Spring 2013, we know that a healthy 99.5% of Arizona households can get broadband of at least 768 Kbps download from at least one provider, not including available satellite service. As we move to rural areas that decreases to 97.6% of households. And for sparsely populated rural areas, the percentage decreases further to 95.7% of households, leaving more than 4% of sparsely populated rural households without any broadband coverage at all except satellite.

When we consider the more reasonable modern connection speed of at least 3 Mbps download, the availability percentages start to visibly decline to 97.5% of households statewide, 88.3% for rural areas, and 81.0% for sparsely populated rural areas leaving some 19% of households in sparsely populated rural areas without what we would consider adequate bandwidth. At a somewhat higher connection speed of 6 Mbps download, the availability percentages more precipitously decline to 95.2% of households statewide, 77.8% for rural areas, and only 65.9% for sparsely populated rural areas leaving some 34% of households in sparsely populated rural areas without such higher performance services.

For the availability of 3 Mbps download from more than a single Broadband Provider, analysis shows that for All Technologies, 97.8% of the statewide population has access to at least one provider, 95.6% access to at least two providers, and 92.3% access to at least three providers. For Arizona's rural areas, 88.8% of the population has access to at least one provider, 78.0% access to at least two providers, and 65.4% access to at least three providers. And for Arizona's sparsely populated rural areas, 81.6% of the population has access to at least one provider, 67.7% access to at least two providers, and 55.2% access to at least three providers.

Looking at specific technologies, DSL, xDSL & other copper delivered services at connection speeds of at least 3 Mbps download are available to 86.4% of households statewide, 55.2% for rural areas, and 43.0% for sparsely populated rural areas. At a somewhat higher connection speed of 6 Mbps download, the availability percentages more precipitously decline to 78.4% of households statewide, 41.0% for rural areas, and only 30.8% for sparsely populated rural areas. The Arizona broadband mapping team has discovered an issue in processing Frontier's DSL coverage and will make corrections in the pending Fall 2013 submittal, likely resulting in reporting of slightly less coverage.

Cable modem services at connection speeds of at least 3 Mbps download are available to 88.7% of households statewide, 55.9% for rural areas, and 34.3% for sparsely populated rural areas. The cable industry has invested heavily in a new generation of DOCSIS 3.0 services to be able to deliver connection speeds of 10 Mbps download or greater to 88.6% of households statewide, but that percentage declines to 55.5% of rural households and only 33.8% of sparsely populated rural households.

Fixed wireless services at connection speeds of at least 768 Kbps download, including Wi-Fi networks and other fixed wireless technologies, are available to 94.7% of individuals statewide, 76.1% for rural areas, and 68.3% for sparsely populated rural areas. At connection speeds of at least 3.0 Mbps, fixed wireless services are available to only 62.0% of individuals statewide, 63.1% of those living in rural areas and 53.2% of those in sparsely populated rural areas.

Mobile wireless services at connection speeds of at least 768 Kbps download, generally 3G services edging into 4G, are available to 98.7% of individuals statewide, 93.7% for rural areas, and 90.2% for sparsely populated rural areas. At connection speeds of at least 3.0 Mbps, well into 4G service range, mobile wireless services have rapidly expanded and are now available to 92.8% of individuals statewide, but only to 68.0% of those living in rural areas and 61.0% of those in sparsely populated rural areas.

Satellite broadband services at connection speeds of at least 1.5 Mbps download are available to all individuals statewide with a view of the southern sky and ability to mount a small satellite dish. Connection speeds of up to 10 Mbps and beyond are available selectively within defined geographic footprints.

Appendix C: WACOG Broadband-Related Web Presence

WACOG has added a broadband information link to their public website on the homepage (<http://www.wacog.com/>) and the WACOG Broadband Steering Committee & Resources content at <http://www.wacog.com/wacog-broadband-steering.html>. This page is intended to provide the public and interested communities with information about the work of the Broadband Steering Committee, information about Arizona broadband initiatives via a link to the DigitalArizona.gov website including a link to the speed test, and reports on Committee activities and specific projects that may be originated by WACOG communities and/or service providers. Periodic updates will be provided by the WACOG, the Committee, and consultant.



[Home](#)
[Community Services](#)
[Early Childhood](#)
[Senior Services](#)
[Transportation](#)
[Message from the Director](#)
[Community Action Agency](#)
[Volunteer Programs](#)
[WACOG Library](#)
[Events Calendar](#)
[News](#)
[Employment](#)
[Webmail](#)
[Tech Support](#)
[Employee Login](#)
[WACOG Broadband Steering](#)
[Site map](#)

WACOG Broadband Steering Committee & Resources

WACOG has formed a **Broadband Steering Committee** with broad participation among economic development, educational technology, transportation, government IT, healthcare, and public safety stakeholders. The Committee and its activities are being funded, in part, by a federal broadband grant administered through the State of Arizona's **Digital Arizona Project (DAP)**. WACOG has been selected to receive these funds to help advance broadband assessment, strategy, and application adoption in our region, Yuma, La Paz, and Mohave counties.

WACOG Broadband Working Documents:

- WACOG Broadband Business Case Assessment (BCA) Report (Pending)
- WACOG Broadband Technical Report (Pending)
- WACOG Broadband Grants & Resources Guide (Pending)
- WACOG Broadband Broadband Steering Committee Meeting Minutes (4/30/13)
- WACOG Broadband Broadband Steering Committee Meeting Minutes (6/6/13)

Arizona Critical Broadband Links:

Digital Arizona Program

- [Digital Arizona Council \(DAC\)](#)
 - [Strategic Plan](#)
 - [Research & Analysis](#)
- [Arizona Broadband Speed Test](#)
- [Arizona Broadband Map \(Basic Version\)](#)
- [Arizona Broadband Map \(Community Planning Advanced Version\)](#)
- [Arizona Strategic Enterprise Technology Office \(ASET\)](#)
 - [Digital Highways \(SB1402\)](#)
- [Arizona Telecommunications & Information Council \(ATIC\)](#)
 - [Arizona Telecommunications & Information Institute \(ATI Institute\)](#)

[Message from the Director](#) | [Community Action Agency](#) | [Community Services](#) | [Early Childhood Services](#) | [Senior Services](#) | [Transportation Services](#) | [Volunteer Programs](#) | [WACOG Library](#) | [Events Calendar](#) | [News](#) | [Employment](#) | [Contact Us](#) | [Employee Login](#) | [WACOG Broadband Steering](#) | [Site Map](#) | [Home](#)

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Appendix D: Arizona Broadband Map

Arizona Broadband Map Overview:

The Arizona Broadband Map features two interfaces, one for the general public and another for community planners or more advanced users. Both versions of the map allow substantial flexibility and usability in navigating to, framing, selecting data, and customizing views.

The Arizona Broadband Map (Basic) is a public map at <http://broadbandmap.az.gov/map/> that provides a detailed and multi-layered map showing the availability and advertised performance of High Capacity Digital Services (Broadband) in the State of Arizona by individual street address or at any point selected. The latest data set for Spring 2013 is current as of December 31, 2012. Links are provided to many providers' websites when the provider is identified as one of those serving an address or location.

The Community Broadband Planning Map at <http://broadbandmap.az.gov/CommunityPlanningMap/> includes a large collection of map layers with a rich set of Spatial Analysis Tools to help community planners make better broadband decisions for their community. The powerful application has Population and Housing data down to the Census Block level. Community broadband consultants have also prepared profile spreadsheets for each Arizona community which are linked from the map and downloadable. There are 10 such community profiles across the WACOG counties.

Both the Basic and Community Broadband Planning mapping applications use ArcGIS Server Technology from Esri, and are accessible by anyone with an Internet connection.

Arizona Broadband Map Details:

The Community Broadband Planning Map was designed to help Community Planners make better broadband decisions for their community and other advanced users optimize and exploit the available data. The central idea behind this added map version was to present a set of tools that would help a planner identify their study area, find all combinations of Broadband Providers, Service Types and Advertised Download/Upload speeds, and quickly chart out the Population and Housing data showing the number of people, average median age, households, average household size, total area, etc.

What makes Arizona's Community Planning Map unique is the power and flexibility it gives users to perform spatial analysis. For example, users can perform a spatial search to find all the Libraries within a specific Zip code. Subsequently, a 2-mile buffer can be drawn around a Library to find all the public schools that fall within this 2-mile radius. The Advertised Upload and Download Broadband Speeds and Service Types to these schools can be instantly charted. Further, all the Census Blocks falling within this 2-mile buffer can be selected and their attributes can be exported to a spreadsheet. Users can easily determine the number of people living within 2 miles of a Library; find their average median age, the total number of households, etc.

All of Arizona's Broadband Providers and their associated metrics can be easily viewed and the results saved as a Comma or Tab Delimited File for further analysis. Available details about the communities or any selected geography include population, gender population, median resident age, Arizona's median age, zip codes, unemployment rate, estimate median household income, median cost of home, population 25 years and over with educational levels, major employers, and occupations.

A Community Planner can readily measure the area and perimeter of their community; find the distance from the nearest Central Office, or major road or highway; and quickly view the Broadband Provider footprints of every provider in the vicinity. Spatial Searches can be made based on a Census Block, Census Block Group, Census Tract, Zip code, School District, County, City or Town, or any arbitrary polygon drawn on the map and combined with demographic criteria and data.

Once a search area is defined, users can easily locate Community Anchor Institutions (CAIs) including Schools, Libraries, Hospitals, Fire Stations, Police Departments, businesses with public wireless networks, etc. plus infrastructure assets such as cellular towers falling within this area. Once searched, one can proceed to draw buffers around selected features, to continue the spatial search process and preparation of custom map views with great utility. The capability to work with percentage of the population below the poverty line has recently been added. As has the ability to visualize and run proximity buffers around selected highway road segments

Some of the latest features added include the capability to build an SQL statement to display the Broadband Footprints of a specific Provider. For example, one can:

- Display the Broadband Footprints of a selected BP such as AT&T Mobility, showing all their speed tiers;
- Further modify the SQL Statement to display only Download Speed Tier = 7, which helps to display just the 4G coverage areas of AT&T Mobility;
- Save your SQL Statements to Notepad for later use;
- Build similar SQL Statements to display the 4G coverage areas of some other carrier, such as Verizon; and
- Display the combined 4G coverage areas of AT&T and Verizon.

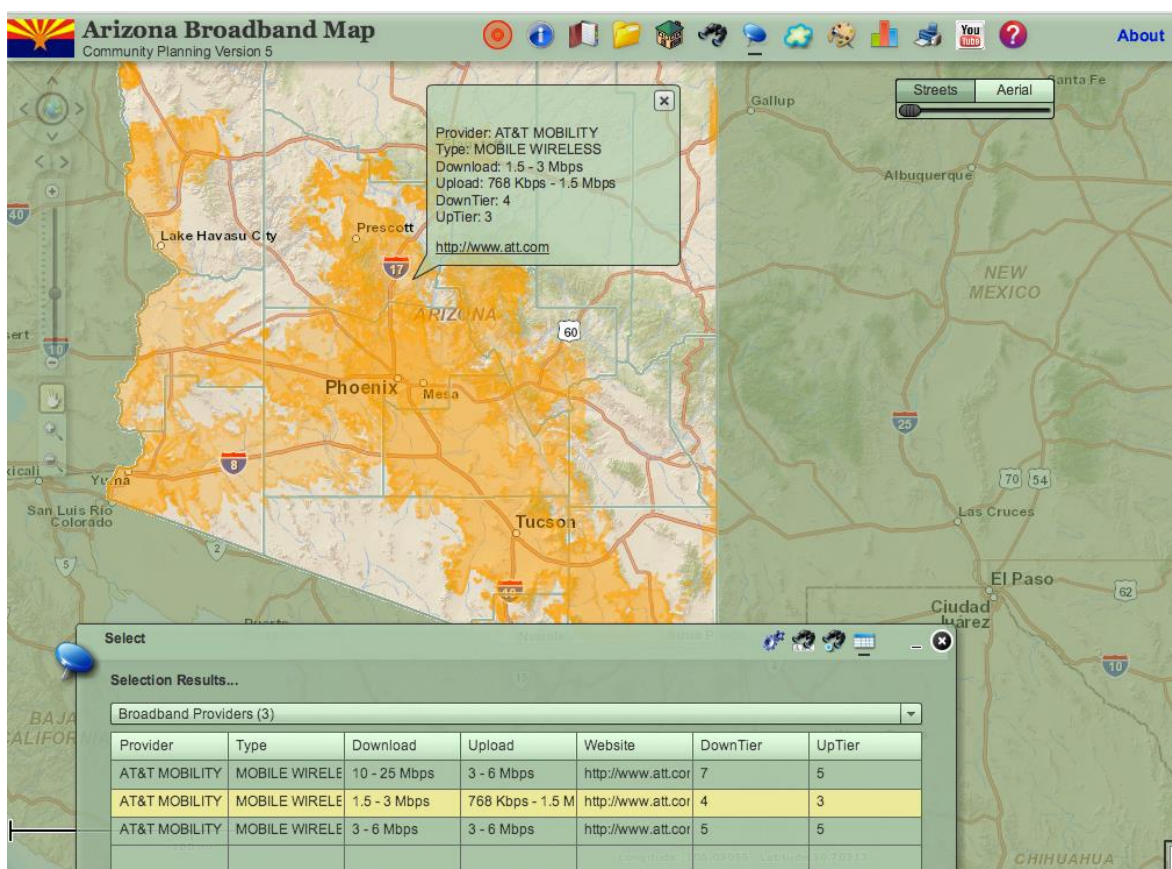
We believe Arizona is unique among the 50 States to have this mapping capability to isolate and display Broadband Coverage areas by a given BP and a given Speed Tier.

Arizona Broadband Map Tutorials:

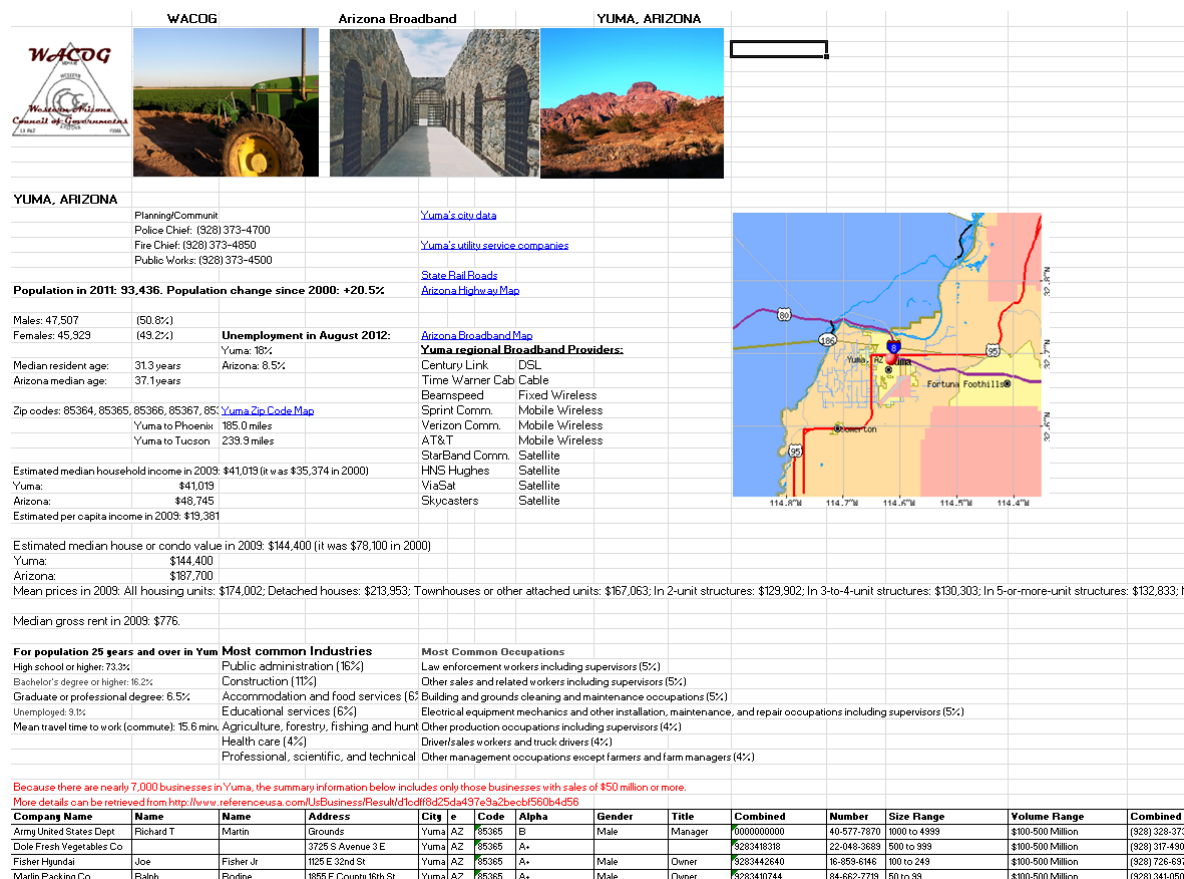
Twenty-four tutorials on how to use various features of the map are available on a dedicated YouTube channel at <http://www.youtube.com/user/ArizonaBroadband>. In addition to providing instructions generally on how to use the map, they also demonstrate functions such as:

- Finding an Address,
- Identifying Broadband Providers,
- Displaying the Map Layers,
- Identifying Community Buildings,
- Buffering Points,
- Graphical Search,
- Text Search,
- Spatial Search and
- Using the Select Widget.

Arizona Community Broadband Planning Map Screenshot



City of Yuma Community Profile Screenshot



Appendix E: DAP Broadband Grants & Resources

Under the auspices of the WACOG Broadband Steering Committee, an extensive **Broadband Grants & Resources Guide** has been developed for **Digital Arizona Program (DAP)**. Please reference the separate standalone document who's Table of Contents follows:

DAP Broadband Grants & Resources Guide

Table of Contents

Preface

Broadband Grants Seekers Introduction

State of Arizona Grant Opportunities

- Arizona Strategic Enterprise Technology Office (ASET)**
- Arizona Governor's Office**
- Arizona Department of Education**
- Arizona State Library, Archives and Public Records**
- Arizona Department of Homeland Security**
- Arizona Department of Commerce (ACA)**
- Science Foundation of Arizona (SFAz)**
- Arizona Corporation Commission (ACC)**
- Arizona Telemedicine Program (ATP)**
- Arizona Grantmakers Forum (AGF)**

Federal Government Grant Opportunities

- General Federal Grant Sources**
- U.S. Dept. of Agriculture (USDA) Rural Utility Services (RUS)**
- Federal Communications Commission (FCC)**
- U.S. Dept. of Commerce (DOC) National Telecommunications & Information Administration (NTIA)**
- U.S. Dept. of Commerce (DOC) Bureau of Economic Analysis**
- Education & Libraries Specific**
- Telehealth Specific**
- Public Safety Specific**
- Small Business Innovation Research (SBIR)**
- Small Business Technology Transfer (STTR)**
- Small Business Administration (SBA) Programs**

Other Grant Opportunities

- Foundations and Trusts - Arizona Specific**
- Foundations and Trusts - National**
- Company and Community Investment**

DAP Broadband Grants & Resources Guide

Table of Contents (Continued)

Broadband Resources

Federal Resources

State Digital Capacity Plans and Resources

Arizona State Resources

National Nonprofit Organizations

National Trade Associations

Arizona Nonprofit Organizations and Trade Associations

National eLearning and Technology in Education Resources

Arizona eLearning and Technology in Education Resources

National Telehealth Resources

Arizona Telehealth Resources

National eGovernment Resources

Arizona eGovernment Resources

National Discovery, Innovation and Research Resources

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National Smart Energy and Environmental Resources

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National Public Safety Communications Resources

Arizona Public Safety Communications Resources

National Native American Resources

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Arizona Statistical Resources

Community Toolkits, Economic and Financial Modeling

Appendix F: Glossary of Telecom Terms

3G or Third Generation Wireless: This refers to the current state of cellular wireless data communications being actively deployed as a market overlay first in urban areas and along transportation corridors. The first generation was analog and the second was digital (CDMA, TDMA and GSM).

4G or Fourth Generation Wireless: This refers to the next step up for mobile wireless currently standardized and beginning to be deployed. Fourth generation systems provide higher-speed data connections of up to 100 Mbps for high mobility users and 1 Gbps for low mobility users, both fixed and mobile.

5G or Fifth Generation Wireless: This refers to the anticipated next step up for mobile wireless beyond 4G, but not yet standardized. Fifth generation systems will likely provide higher-speed data connections, both fixed and mobile with greater spectral and/or energy efficiency with improved service quality and user experience.

Antenna: Any structure or device used to transmit and/or receive electromagnetic waves for the provision of wireless services including, but not limited to, cellular, paging, personal communications services (PCS), and microwave communications.

Asymmetric: A connection with more capacity in one direction than the other. Most DSL and cable modem links are asymmetric, with higher capacity (speed) in the downstream path.

Attenuation: the deterioration of a signal over distance. Also may be referred to as “loss”

Backbone: This refers to the highest speed and widest bandwidth point of a communications circuit or path. In most cases data sources such as shared servers are connected to the backbone, with lower bandwidth circuits extending to user stations.

Backhaul: The intermediate links between the backbone of the network and the sub-networks or provider networks. See also “middle mile.”

Bandwidth: The amount of data (capacity) that can be carried by a circuit between two points of a network. Bandwidth is typically measured in Kilobits per second or Megabits per second (shortened to Kbps and Mbps). The top speed of modems is 56 Kbps. One strand of fiber optics can carry 20,000,000,000 bits per second (20 Gbps) or more.

Base Station: The central radio transmitter/receiver that maintains communications with end user sites within a given range. Although many base station site antennas are placed on specially constructed towers, where existing structures provide a site that is higher than its surroundings, antennas can be placed on those structures. For example, antennas have been placed on water towers, grain silos, and building rooftops.

BPL: Broadband over Power Line: A technology that allows broadband services to be delivered via electric lines. BPL is discussed in the **Potential Broadband Technologies** section of this report.

Broadband: A generic term for high-speed data transmissions. The current federal definition of broadband is a minimum of 768 Kbps downstream and 200 Kbps upstream.

Cable Modem: A device used to provide data services over a cable TV network. Users in a given locality (determined by the provider) share the available bandwidth, so when many local users are connected simultaneously they experience slower network performance.

Cell: The basic geographic unit of a wireless system, also the basis for the generic industry term ‘cellular.’ A geographic area is divided into ‘cells,’ each of which is equipped with a low-powered radio transmitter/receiver. The cells can vary in size depending upon terrain, capacity demands, etc. See also Base Station, Cell Site.

Cell Site: The place where communications equipment is located for each cell. A cell site includes antennas, a support structure for those antennas, and communications equipment to connect the site to the rest of the wireless or wired network. The equipment is normally housed in a small shelter or “hut” at the base of the site. See also Base Station, Cell.

Central Office: A term used by carriers when referring to switching points. May also be called a local exchange or telephone exchange.

CLEC: Competitive Local Exchange Carrier. A new entrant in a telecommunications market previously limited to one carrier. Contrast with ILEC.

Colocation: The siting of two or more separate companies' (or departments') equipment in or on the same structure/tower or building without the need to construct a new support structure or require a substantial increase in the size of an existing structure.

Contention: When multiple customers share a finite amount of broadband capacity and simultaneous use, they "contend" or compete with one another for that limited resource. Contention may be due to increased use or to inherent system design constraints. Synonymous with oversubscription.

CPE: Customer Premises Equipment. CPE is a term that refers to any equipment that is located at the customer's site.

Downstream/download: Data transfer from the web/Internet "down" to the customer. Typically measured in thousands of bits per second (Kbps) or millions of bits per second (Mbps). See also Upstream/upload.

DS-3 (Digital Signal, Level 3): A 44.736 Mbps carrier facility, (also referred to as a T3, and generally thought of as 45 Mbps), which is the equivalent of 28-T1 connections.

DAS: Distributed Antenna Systems. An alternative wireless network technology utilizing small antennas usually mounted on existing infrastructure in the public rights-of-way, such as utility poles, and are connected to a central hub by wireless or fiber backhaul. Due to their limited power and coverage area, DAS elements are typically deployed to supplement traditional macro sites.

DSL: Digital Subscriber Line. A service providing data connectivity (to the Internet or private networks) over ordinary copper telephone lines. DSL circuits are switched, not shared as cable modems, but bandwidth can vary greatly, based on both distance and the quality of the circuit. There is typically a distance limitation of approximately 12,000 to 18,000 feet from the nearest main facility (telephone company central office or equivalent).

DSLAM: DSL Access Multiplexer. Used to aggregate many DSL connections onto a single higher-bandwidth connection/link. DSLAM equipment is typically placed in above-ground equipment cabinets within or at the edge of neighborhoods.

Ethernet: Ethernet is a family of computer networking technologies for local area networks (LANs), standardized in 1985 as IEEE 802.3 and largely replacing competing wired LAN technologies. It is generally carried over twisted pair wiring and fiber optic links in conjunction with hubs or switches at data rates from 10 Mbps to 1 Gbps on LANs and up to 100 Gbps on MANs and WANs.

FCC: Federal Communications Commission. The government agency responsible for regulating telecommunications in the United States.

Fixed wireless: Refers to wireless systems that are permanently installed and designed to cover a specific area or site.

Gbps: Gigabits per second. A thousand Mbps or a million Kbps.

ILEC: Incumbent Local Exchange Carrier. The former monopoly local telephone carrier. Contrast with CLEC.

ISP: An Internet service provider is a business or organization that offers users access to the Internet and related services. Many but not all ISPs are telephone companies or other telecommunication providers and may be organized as commercial, community-owned, non-profit, or otherwise privately owned entities. They may provide a variety of services such as Internet access and transit, domain name registration, web site hosting, and colocation.

Kbps: Kilobits per second. Thousands of bits per second.

LAN: Local Area Network. A local area network is a computer network interconnecting computers, storage, and other peripherals in a limited area such as a home, school, computer laboratory, or office building over a small geographic area using Ethernet, Wi-Fi, and possibly other short range interconnection technologies. See also MAN and WAN.

"Last-mile" (sometimes referred to as "first mile"): This term is used to describe the final connection to a building as opposed to the high capacity circuits extending across a city or county. This connection is often the bottleneck that prevents high-speed network connectivity, due to lack of high capacity cabling options. Contrast with "middle mile."

Latency: The time it takes for a signal to travel between two points on a network. Also referred to as “delay”. When there is significant latency a normal voice conversation may be very difficult as the parties must wait for responses and may “talk over” each other.

Leased Line Services: These are typically communications circuits provided by a telephone company or cable company and leased for a monthly fee to a customer such as a city or school district. Typical leased lines include T-1 and T-3.

Line of Sight (LOS): Transmission limited to straight lines and in which the transmitting/receiving locations can be viewed/seen from one another. Most wireless wide area network transports require a line of sight from the sending location to the receiver.

MAN: Metropolitan Area Network. A metropolitan area network is a large computer network that spans a medium size geographic area such as a campus up to an entire metropolitan area, falling between a LAN and WAN. MANs provide Internet connectivity for LANs in a metropolitan region, and connect them to wider area networks like the Internet. See also LAN and WAN.

Mbps: Megabits Per Second - Million bits per second. Telephone modems operate at Kbps (thousands of bits per second) speeds, whereas local area networks operate at Mbps. See also Gbps.

Microwave: The portion of the electromagnetic spectrum, beginning with 1 GHz, which is used for many different wireless communications. Microwave links are often used in links where there is a line of site and a distance of less than 30 miles.

Middle mile: May also be referred to as backhaul. The links between ISPs and local or regional broadband service providers are considered “middle mile” connections. Contrast with “last mile”.

Monopole: A slender, self-supporting tower on which wireless antennas can be placed.

Oversubscription: See contention.

PROW: Public Right-of-Way or Public Rights-of-Way. The land/areas owned by a public entity such as a city or county that are used for installation of telecommunications and other services. For example, most counties own and control the PROW along county roads.

Right-of-Way (for outside plant cable): Refers to a designated space alongside a street or other access (such as a railroad line). An entity wishing to install cable among buildings must obtain the rights to a pathway for that cable. Right-of-way access must be granted by the owner of the path to be used, which may include public landowners (city, county, etc.), private landowners (railroad companies), or the owners of poles such as cable, telephone, or power companies. Cities typically require written permits for the use of their rights-of-way - usually for a fee. See also PROW.

Router: A device that “translates” among different types of network connections and speeds, and can also perform basic security functions. Routers are most frequently used at the point of incoming services such as ISP or carrier WAN connections.

Site Survey: Internet service provider personnel visit your home or business location to determine whether service is/can be made available there.

Symmetric: Used to describe communications technologies in which the upstream and downstream data rates are identical - e.g., High Bit-rate Digital Subscriber Line.

T-1 (DS1): In the United States the T-1 standard has a speed of 1.544 Mbps. T-1 circuits usually are provided by telephone companies using copper cabling, but fiber and wireless systems can be set up to provide T-1 connectivity as well.

Take Rate: The percentage of households or business that are offered service who choose to subscribe to that service. For example, if DSL service were available to 100 households and 33 elected to “take” that DSL service, the take rate would be 33%.

Underserved and Unserved: The FCC recently defined these terms that describe areas that lack broadband access. For complete definitions refer to the July 9, 2009 Federal Register Notice of Funds Availability (NOFA) at: http://www.ntia.doc.gov/files/ntia/publications/fr_bbnofa_090709.pdf.

Upstream/upload: Data transfer from the customer back to the web/Internet or provider. Typically measured in thousands of bits per second (Kbps) or millions of bits per second (Mbps). See also Downstream/download.

VoIP: Voice over Internet Protocol. A technology that puts voice (telephone) conversations over an IP “data” network. Can be used to aggregate (or “trunk”) multiple calls between buildings, or for individual calls from an IP-enabled telephone or from a computer equipped with a microphone and speaker. Skype is one example of VoIP.

VPN: Virtual Private Network. A network set up for specific sites and users and open only to authorized users. A VPN uses encryption to prevent communications from being deciphered by non-authorized personnel.

WAN: Wide Area Network. A wide area network is used to extend connectivity beyond a building or campus, usually through telephone carrier facilities, but may also be privately installed and owned. See also LAN and MAN.

Wi-Fi: Wi-Fi is a popular technology that allows an electronic device to connect to a LAN and through it to exchange data or connect to the Internet wirelessly over unlicensed spectrum with various levels of encryption and security. Devices connect to network resources via a wireless network access point (AP) or hotspot with a range of up to about 65 feet indoors and greater distances outdoors depending on configuration, antennas, and mesh connections with other Wi-Fi APs. Wi-Fi is defined by IEEE 802.11 wireless LAN standards

WiMAX: WiMAX (Worldwide Interoperability for Microwave Access) is a wireless communications standard designed to provide some 30 to 40 megabit-per-second data rates and up to 1 Gbps for fixed locations enabling the delivery of last mile wireless broadband access as an alternative to cable and DSL. It is similar to Wi-Fi, but it can enable usage at much greater distances and speeds. WiMAX is defined by IEEE 802.16 wireless LAN standards ratified by the WiMAX Forum. A variant, Mobile WiMAX is being selectively employed to complement or compete with 4G mobile wireless.

Wind load: The designed capacity of a tower to withstand wind forces. Each structure (mast, antenna, etc.) added to a tower adds to the overall wind load of that tower.

WISP: Wireless Internet Service Provider. A company that distributes Internet service via wireless networking. In order to provide service to a given location or territory. A WISP may develop its own tower sites and/or may lease space on towers or structures owned by others.